KEMESS UNDERGROUND PROJECT

ASSESSMENT REPORT

With respect to:
the Application by AuRico Metals Inc.
for an Environmental Assessment Certificate
pursuant to the *Environmental Assessment Act,* S.B.C. 2002, c.43

and

the *Canadian Environmental Assessment Act, 2012*, S.C. 2012 c. 19,

as a Substituted Environmental Assessment

Prepared by:

Environmental Assessment Office
Feburary 16, 2017

BRITISH
COLUMBIA

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Acronyms, Abbreviations and Definitions used in this Report

%	percent
µg/L	micrograms
µg/m³	micrograms per cubic metre
AAQC	Ambient Air Quality Criteria
Aboriginal Interests	asserted or established Aboriginal rights, including title and treaty rights
Ag	silver
Al	aluminum
AIA	Archaeological Impact Assessment
AIR	Application Information Requirements
APEGBC	The Association of Professional Engineers and Geoscientists of BC
Application	Application for an Environmental Assessment Certificate
ARD	acid rock drainage
As	arsenic
AuRico	AuRico Metals Inc.
B	boron
Ba	barium
BAT	Best Available Technologies
BC	British Columbia
BC FNFNES	BC First Nations Food, Nutrition and the Environment Study
Be	beryllium
BEC	biogeoclimatic ecosystem classification
BLI	Black Lake Intrusive
BRFN	Blueberry River First Nations
C	Celsius
Ca	calcium
CA	Collaboration Agreement
CALMET	California Meteorological Model
CALPUFF	California Puff Model
Cd	cadmium
CEAA 2012	Canadian Environmental Assessment Act, 2012
CH	critical habitat

CH4	methane
CHPA	critical habitat protection assessment
Cl	chloride
CO	carbon monoxide
Co	cobalt
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalents
COPC	contaminants of potential concern
COSEWIC	Committee on the Status of Wildlife in Canada
CPD	Certified Project Description
Cr	chromium
CSFN	Carrier Sekani First Nations
CSTC	Carrier Sekani Tribal Council
Cu	copper
CULRTP	Current Use of Lands and Resources for Traditional Purposes
CWS	Canadian Wildlife Service
dm2	square decimetres
DRFN	Doig River First Nation
EA	environmental assessment
EAC	Environmental Assessment Certificate
EAO	Environmental Assessment Office
ECCC	Environment and Climate Change Canada
ECDA	Economic and Community Development Agreement
EFAP	Employee and Family Assistance Program
EMA	Environmental Management Act
EMP	Environmental Management Plan
EPIC	EAO's Project Information and Collaboration System
ERP	Emergency Response Plan
Fe	iron
FIFO	fly-in, fly-out
FLNRO	Ministry of Forests, Lands and Natural Resource Operations
FMEA	Failure Mode Effects Analysis

FNFN	Fort Nelson First Nation
G2G	government-to-government
GHG	greenhouse gas
GHG Report	Greenhouse Gas Assessment Report
ha	hectares
HCA	Heritage Conservation Act
Hg	mercury
HHRA	Human Health Risk Assessment
HMSP	Health and Medical Services Plan
HQ	hazard quotients
HRFN	Halfway River First Nation
HWMP	Health and Wellness Management Plan
IBA	Impact-Benefit Agreement
IDZ	Initial Dilution Zone
ILCR	incremental lifetime cancer risk
IMA	Interim Measures Agreement
Independent Panel	Mount Polley Independent Expert Engineering Investigation and Review Panel
IPCC	Intergovernmental Panel on Climate Change
IR	Indian Reserve
K Value	hydraulic conductivity value
km	kilometres
km2	square kilometres
KN	Kemess North
KS	Kemess South Mine
KSM	Kerr-Sulphuret-Mitchell Project
kt	kiloton
KUG Project	Kemess Underground Project
kV	kilovolt
KwN	Kwadacha Nation
L/s	litres per second
Li	lithium

LPU	local population unit
LRMP	Mackenzie Land Resource Management Plan
LSA	Local Study Area
m	metre
M	million
m3	cubic metres
m3/s	cubic metres per second
MA	Mines Act
masl	metres above sea level
MeHg	methylmercury
MEM	Ministry of Energy and Mines
mg	milligrams
Mg	magnesium
mg/dm2/day	milligrams per square decimetre per day
mg/L	milligrams per litre
Mining Code	Health, Safety and Reclamation Code for Mines in British Columbia
ML	metal leaching
MLIB	McLeod Lake Indian Band
MMPO	Major Mines Permitting Office
Mn	manganese
MNBC	Métis Nation British Columbia
Mo	molybdenum
ENV	Ministry of Environment
MOU	*Memorandum of Understanding between the Canadian Environmental Assessment Agency and the BC Environmental Assessment Office on Substitution of Environmental Assessments (2013)*
MR	Metals Removal
N	nitrogen
N_2O	nitrous oxide
Na	sodium
Ni	nickel
NO_2	nitrogen dioxide
NO_x	nitrogen oxides

NRCan	Natural Resources Canada
ORAR	Omineca Resource Access Road
PAC	Potentially Affected Communities
PAG	potentially acid generating
Pb	lead
pH	potential of hydrogen
PM	particulate matter
PM_{10}	particulate matter with a diameter less than 10 micrometres
$PM_{2.5}$	particulate matter with a diameter less than 2.5
POC	Parameters of concern
ppm	parts per million
PRFN	Prophet River First Nation
PRRD	Peace River Regional District
QP	Qualified Professional
RISC	Resources Information Standards Committee
RSA	Regional Study Area
SARA	*Species at Risk Act*
Sb	antimony
Se	selenium
SeCP	selenium collection pond
Selen-IX	Selenium Treatment Plant
SFN	Saulteau First Nation
SMS	Sustainability Management System
SO_2	sulphur dioxide
SO_4	sulphate
SO_x	sulphur oxides
SOP	standard operating procedures
St	strontium
TEDE	Total Estimated Daily Exposure
the Act	Environmental Assessment Act
the Agency	Canadian Environmental Assessment Agency
Ti	thallium

TKD	Tsay Keh Dene Nation
TKN	Tse Keh Nay
TLFN	Takla Lake First Nation
TOC	Table of Conditions
tpd	tonnes of ore per day
TSF	tailings storage facility
TSP	total suspended particulate
TSS	total suspended solids
U	uranium
UOS	Metis Nation BC Metis Traditional Land Use and Occupancy Report
Updated Feasibility Study	Feasibility Study Update with respect to the Application for an Environmental Assessment Certificate for the Kemess Underground Project
V	vanadiuim
VC	valued component
WMFN	West Moberly First Nation
WMU	Wildlife Management Units
Working Group	Advisory Working Group
WQG	BC Water Quality Guidelines
Zn	zinc
ZTO	zone of trace occurrence

Executive Summary

Overview

AuRico Metals Inc. (AuRico) is proposing the construction, operation, and closure of the Kemess Underground Project (KUG Project), located approximately 250 kilometres (km) north of Smithers in north central British Columbia (BC). The KUG Project would be an underground copper-gold mine which is designed to process an average of approximately 24,650 tonnes of ore per day over a 13-year mine life. During the life of mine operations, the KUG Project would produce an anticipated 1.3 million (M) ounces of gold and 563 M pounds of copper. AuRico is a Canadian precious metals royalty and development company and has 100% ownership of the KUG Project.

The KUG Project is subject to an environmental assessment (EA) under BC's *Environmental Assessment Act* (the Act) by the BC Environmental Assessment Office (EAO), and the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) by the Canadian Environmental Assessment Agency (the Agency). On April 8, 2014, the former federal Minister of the Environment approved the substitution of the federal EA process under CEAA 2012 with the process conducted under the Act. The substitution decision was granted in consideration of the approach set out in the *Memorandum of Understanding between the Canadian Environmental Assessment Agency and BC's Environmental Assessment Office on the Substitution of Environmental Assessments, 2013* (MOU).

EAO prepared this Assessment Report in consultation with an Advisory Working Group (Working Group), made up of federal, provincial and local government representatives with mandates and skill sets relevant to the review of the KUG Project, and in collaboration with representatives of Takla Lake First Nation (TLFN), Tsay Keh Dene Nation (TKD) and Kwadacha Nation (KwN), collectively known as Tsay Keh Nay (TKN). The Agency also provided advice to EAO in relation to fulfilling the requirements related to CEAA 2012.

EAO undertook consultation activities during the course of the EA, including holding three official comment periods. All public comments, comments from Aboriginal groups and AuRico and EAO's responses to these comments, were considered in completing the EA.

In conducting this EA, EAO considered the potential environmental, economic, social, heritage, and health effects; including cumulative effects of other projects or activities, of the KUG Project for the provincial EA. For the purposes of meeting the CEAA 2012

substitution requirements, EAO considered effects that the KUG Project may have on environmental effects described in subsections 5(1) and 5(2) of CEAA 2012, as well as the *Species at Risk Act* (SARA), subsection 79(2).

Assessment of Effects

EAO uses valued components (VC) as an organizing framework for the assessment of the potential effects of proposed projects. VCs are components of the natural and human environment that are considered by AuRico, the public, Aboriginal groups, scientists and other technical specialists, and government agencies involved in the assessment process to have scientific, ecological, economic, social, cultural, archaeological, historical or other importance.

The EA included VCs related to air quality, greenhouse gas (GHG) emissions, hydrogeology, surface hydrology, surface water quality, fish and aquatic habitat, wildlife, terrain and soils, terrestrial ecology, economic and social conditions, heritage resources, and human health.

EAO assessed the potential for the KUG Project to have significant adverse effects on the VCs and on the requirements of CEAA 2012. This included an assessment of the impacts the KUG Project could have on Aboriginal groups and their interests. The assessment also considered how accidents and malfunctions and changes to the environment could affect the VCs and Aboriginal peoples. These assessments were based on the Application provided by AuRico and informed by comments received from the Working Group, Aboriginal groups and the public.

AuRico proposed mitigation measures to avoid or minimize the adverse effects of the KUG Project. In consideration of AuRico's proposed mitigation measures and the comments received during the review of the Application, EAO is proposing 33 conditions, each of which includes measures to mitigate the effects of the KUG Project. If provincial Ministers issue an Environmental Assessment Certificate (EAC), they may establish these conditions as legally binding requirements. Mitigation conditions will also be proposed by the Agency for consideration by the federal Minister of Environment and Climate Change as legally binding conditions in a CEAA 2012 decision statement should the KUG Project be allowed to proceed.

The following are some of the key mitigation measures that are included in the conditions EAO proposes to provincial ministers:

- An Aboriginal groups monitoring program that provides employment opportunities for individuals of TKN to participate in environmental monitoring of KUG Project activities;

- Establishment of an Environmental Monitoring Committee to provide a forum for information sharing, and discussion of topics of interest to TKN including water management and water quality monitoring to ensure that TKN and relevant government agencies are involved in the ongoing development of the mine, mitigation and monitoring measures and adaptive management;
- A communication plan for accidents and malfunctions to address how Aboriginal groups, communities and other users of the area would be notified in the event of an accident (e.g., tailings breach), the remedial action being taken by AuRico and subsequent monitoring;
- Surface water quality monitoring for Amazay Lake and groundwater monitoring to detect potential groundwater movement from the underground workings towards Amazay Lake;
- Treatment of the effluent from the KUG Project tailings storage facility (TSF) for metals and selenium (Se) until it is acceptable for discharge to the receiving environment;
- Se concentrations of the discharge to Waste Rock Creek from the KUG Project TSF during post-closure do not incrementally affect Se concentrations in Waste Rock Creek;
- Staged discharge from the KUG Project TSF to Attichika Creek to a volume proportional to the Attichika Creek monthly streamflow and restricted to the open water months;
- A fish and aquatic effects monitoring plan to monitor concentrations of bioaccumulative substances in bull trout in Thutade Lake;
- An ecosystems management plan, which would include monitoring and mitigation of effects to wetlands;
- A wildlife management and monitoring plan, which would address monitoring and mitigation of effects to wildlife, birds, bats, alpine species, caribou and effects to wildlife along the Omineca Resource Access Road;
- An air quality management plan that would include mitigations and/or monitoring for particulate matter, dust emissions and metals in dust at the camp;
- A health services management plan to address the provision and coordination of health services to employees of the KUG Project; and
- A socio-community and economic effects management plan to address mitigation measures and potential impacts to communities from the KUG Project.

Prior to construction, AuRico would also be required to obtain a *Mines Act* permit issued by the Ministry of Energy and Mines and an effluent discharge permit issued under the *Environmental Management Act* by the Ministry of Environment and various ancillary permits issued by other provincial agencies. The coordinated authorizations process for

these permits would involve the requirements for additional conditions and/or mitigation measures. Permit application requirements would include, but are not limited to the following:

- Planning for reclamation and effective mine closure;
- Detailed mine plans with specific requirements for underground workings, processing plants, tailings management facilities and other components;
- Specific requirements for the protection of land and watercourses including wastewater treatment, storage and effluent discharge;
- Geotechnical, hydrological and hydrogeological considerations for the management of the mine site (i.e., the disturbed area and infrastructure associated with the mine); and
- Mine management plans to address environmental, operation and health and safety issues associated with mine construction, operations and closure.

In consideration of the mitigation measures that would be required of the KUG Project, either in the EAC, if approved, or in subsequent regulatory processes, EAO concludes that the KUG Project would result in residual adverse effects that include:

- A contribution to climate change from GHG emissions from stationary fuel combustion and transportation;
- Impacts to groundwater quantity and surface hydrology from underground development and streamflow alterations resulting from KUG Project discharge;
- Impacts to groundwater and surface water quality resulting from sedimentation, erosion and increased concentrations of contaminants of potential concern;
- Impacts to fish and aquatic habitat quality due to increased water quantity and decreased water quality in Attichika and Waste Rock creeks;
- Direct and indirect wildlife mortality and wildlife habitat loss and alteration due to land clearing, new infrastructure and subsidence, roads and attractants;
- Effects on terrain stability and soil quantity and quality due to KUG Project development and subsidence;
- Loss and alteration of harvestable plant habitat, alpine and parkland and forested ecosystems; and
- Impacts to labour market condition due to loss of employment at closure and competition for skilled labour and wage inflation during construction and operations.

For the purposes of the EA required under CEAA 2012, EAO concludes that the KUG Project would result in residual adverse effects that, in addition to those above, include:

- Impacts on Aboriginal peoples' resource harvesting and current use of lands and resources for traditional purposes due to:
    - Access restrictions;
    - Impacts to resources (e.g., wildlife);

    - Potential impacts to quality of experience through increased human presence in the area; and
    - Perception of country foods contamination;
- Habitat loss, alteration and/or sensory disturbance for SARA-listed wildlife species including woodland caribou, western toad, rusty blackbird, common nighthawk, olive-sided flycatcher, little brown myotis, and short-eared owl; and
- Impacts on migratory birds from habitat loss and alteration and sensory disturbance.

Aboriginal Consultation

EAO and the Agency worked together to identify which Aboriginal groups could potentially be impacted by the KUG Project based on the following factors:

- Strength of the case for the asserted or established Aboriginal rights, including title and treaty rights (Aboriginal Interests) that may be adversely affected; and
- Seriousness of the KUG Project's potential to adversely impact these Aboriginal Interests.

The KUG Project is within the traditional territories of TLFN and TKD, and immediately upstream of KwN territory. The KUG Project is adjacent (upstream) to the traditional territory of Gitxsan wilp Nii Kyap. The KUG Project is within the Treaty 8 disputed area[1] and West Moberly's preferred territory. Métis Nation BC (MNBC) asserts rights and traditional uses over the entire province of BC and has indicated that historic, current and potential future resource harvesting and cultural activities occur in a "buffer zone", which is within 200 km of the KUG Project. EAO notified MNBC of key milestones during the EA to meet federal consultation agreements consistent with the MOU.

EAO worked in collaboration with TKN, according to a mutually agreed-upon collaboration plan, throughout Application review to discuss project-specific issues, assess the potential adverse effects of the KUG Project on the Aboriginal title, rights, and interests of the TKN First Nations, and seek consensus on proposed conditions and recommendations to provincial Ministers. Prior to Application review, EAO provided TKN with opportunities for review and comment on key EA documents (including the VC Selection Document and Application Information Requirements). TKN was an active member of the Working Group. EAO notified Gitxsan, Treaty 8 First Nations and MNBC of EA milestones and provided them with the opportunity to comment on the Application and EAO's assessment report. All Aboriginal Groups were provided an opportunity to comment on draft provincial and federal conditions.

[1] Treaty 8 secures treaty First Nations the right to hunt, fish and trap within the treaty area, subject to the right of the Crown to "take up" lands for various purposes. The KUG Project is within an area which is subject to ongoing litigation with the Province regarding the location of the western boundary of Treaty 8 territory.

Taking into consideration EAO's significance analysis of residual adverse effects from the KUG Project and the available information on Aboriginal groups' areas of traditional use within the KUG Project area, EAO concludes that the KUG Project has the potential to impact the Aboriginal title, rights, and interests of the TKN First Nations related to hunting, fishing, trapping, gathering, effects to water quality, sense of connection to the land and access to trails and travel ways. EAO and TKN conclude that the key mitigation measures, proposed conditions and accommodation measures would adequately accommodate the assessed potential effects to the Aboriginal title, rights, and interests of the TKN First Nations from the KUG Project at the EA stage. EAO concludes that the KUG Project is not expected to impact the Aboriginal Interests of Gitxsan, Treaty 8 or MNBC, including use of culturally significant sites. In the context of potential impacts on Aboriginal Interests EAO also considered: the importance of the KUG Project to the local, regional, and provincial economy; the resources or values that may no longer be available for future generations; and the benefits of the KUG Project to Aboriginal groups.

Conclusion

EAO concludes that, considering the analysis and implementation of the proposed conditions, the KUG Project would not result in significant adverse effects.

PART A – INTRODUCTION AND BACKGROUND

1 Introduction

1.1 Purpose of the Assessment Report

This Assessment Report summarizes the procedures and findings of the environmental assessment (EA) conducted by the British Columbia (BC) Environmental Assessment Office (EAO) on the Application for an Environmental Assessment Certificate (Application) for the proposed Kemess Underground Mine Project (KUG Project) submitted May 2016.

EAO prepares this report as the Assessment Report for provincial Ministers who are responsible for making a decision on the KUG Project under section 17 of BC's *Environmental Assessment Act* (the Act). For mining projects, the deciding provincial Ministers are the Minister of the Environment and the Minister of Energy and Mines.

On April 8, 2014, the former federal Minister of the Environment approved the substitution of the BC EA process for the federal process for the KUG Project. The substituted process must meet the EA requirements of the *Canadian Environmental Assessment Act, 2012* (CEAA 2012).

The approval was granted with the understanding that the EA would be conducted by EAO in accordance with *the Memorandum of Understanding between the Canadian Environmental Assessment Agency and the BC Environmental Assessment Office on Substitution of Environmental Assessments (2013)* (MOU) entered into by Canadian Environmental Assessment Agency (the Agency) and EAO. The essence of the MOU on substitution is that EAO would consider the factors as set out in subsection 19(1) of CEAA 2012, including but not limited to Section 5 of CEAA 2012, when conducting the EA, would gather information from Aboriginal groups about the impacts of the project on their potential or established Aboriginal treaty rights and ways to prevent, mitigate or otherwise address those impacts as appropriate, and would provide an EA report to the Agency that includes the findings and conclusions of the EA with respect to those factors. Ultimately, substitution results in one EA process designed to support the making of both provincial and federal decision EA decisions.

The Assessment Report will be submitted to the Agency and will inform the Minister of the Environment and Climate Change's decision-making under CEAA 2012. Consistent with paragraph 34(1)(e) of CEAA 2012, the Assessment Report will be made available to the public at the conclusion of the EA.

This Report:

- Describes the KUG Project, substituted EA process, and consultation undertaken during the EA;
- Documents work undertaken by EAO to consult and accommodate Aboriginal groups in keeping with the Supreme Court of Canada's direction in *Haida v. Minister of Forests* and related case law;
- Documents procedural aspects of consultation with Aboriginal groups, including MNBC on behalf of Canada;
- Identifies the potential environmental, economic, social, health and heritage effects of the KUG Project, including cumulative effects and how AuRico Metals Inc. (AuRico) proposes to mitigate adverse effects;
- Identifies the residual adverse effects after mitigation;
- Summarizes all Environmental Management Plans (EMP) and follow up plans described in the Application;
- Identifies the conditions proposed by EAO; and
- Sets out conclusions based on the KUG Project's potential for significant adverse residual effects with respect to both the Act and CEAA 2012.

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

- The Application and supplemental information provided by AuRico;
- Advice provided on the Application and supplemental information by the Advisory Working Group (Working Group) and Aboriginal groups; and
- Input received from members of the public.

This information has been posted to EAO's Project Information and Collaboration System (EPIC).

1.2 Project Overview

1.2.1 Proponent Description

AuRico is a Canadian precious metals royalty and development company. AuRico has royalty assets in the several projects in Ontario, two in Australia and 100% ownership of the KUG Project. AuRico's corporate headquarters are in Toronto, Ontario, and it also has an office in Smithers, BC.

1.2.2 Project Location

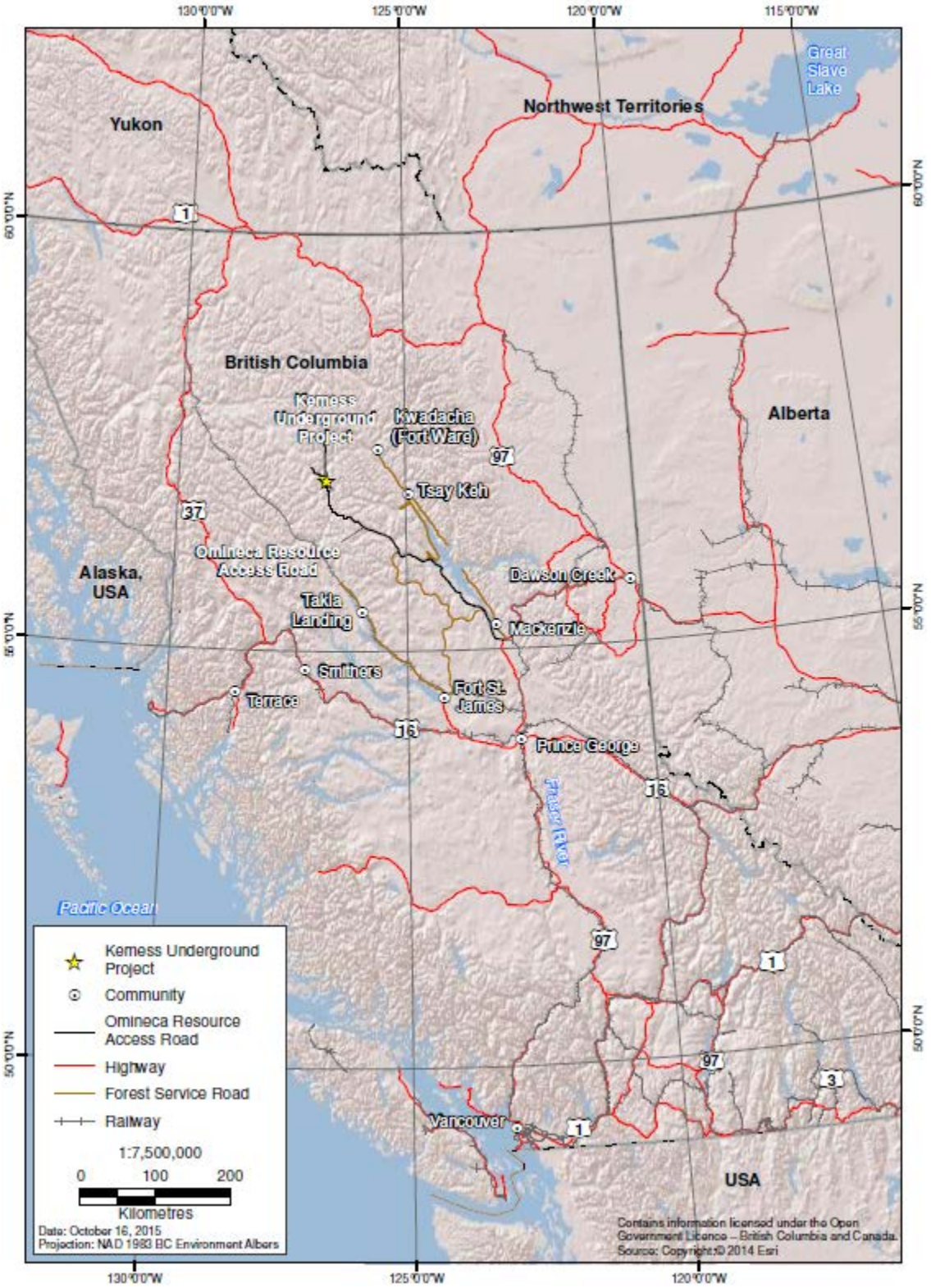
The KUG Project is located approximately 250 km north of Smithers, and 430 km northwest of Prince George in the Peace River Regional District (PRRD) as shown in

Figure 1. The KUG Project deposit is approximately 6 km north of the existing infrastructure from the past-producing Kemess South Mine (KS). The KUG Project is accessed via the existing Omineca Resource Access Road (ORAR) from Mackenzie. The closest communities to the KUG Project by air are Kwadacha (Fort Ware; 79 km), Tsay Keh (111 km), and Takla Landing (182 km).

The KUG Project is within the traditional territories of Takla Lake First Nation (TLFN) and Tsay Keh Dene First Nation (TKD), and immediately upstream of Kwadacha First Nation (KwN) territory. TLFN, TKD and KwN have a common Sekani heritage and have formed an alliance called the Tse Keh Nay (TKN).

The KUG Project is adjacent to and upstream of the traditional territory of Gitxsan wilp Nii Kyap and is within the Treaty 8 Disputed Area (the area of disagreement concerns the western boundary of Treaty 8 between the Federal and Provincial governments). MNBC has indicated that they use land across all of BC for traditional uses. EAO consulted with MNBC on behalf of the federal government.

Figure 1: Project Location



1.2.3 Project Description

AuRico is proposing to construct and operate an underground copper-gold mine with an average annual production of approximately 24,650 tonnes of ore per day (tpd) over a 13-year period (average annual production would be 9 million tonnes). As the KUG Project is a modification of the KS Environmental Assessment Certificate (EAC), the proposed changes would normally be subject to an amendment process, and not trigger a new EA. However, in order to ensure the KUG Project was subject to the same EA requirements as for a project that met the thresholds in the *Reviewable Projects Regulation*, AuRico formally requested to EAO that the KUG Project be designated as a reviewable project and EAO granted this request on February 7, 2014.

The KUG Project triggers a federal EA under CEAA 2012, as it exceeds the production thresholds for a gold mine of 600 tpd, as set out in subsection 16(c) of the *Regulations Designating Physical Activities* and the Agency is of the view that the KUG Project should be considered a new mine.

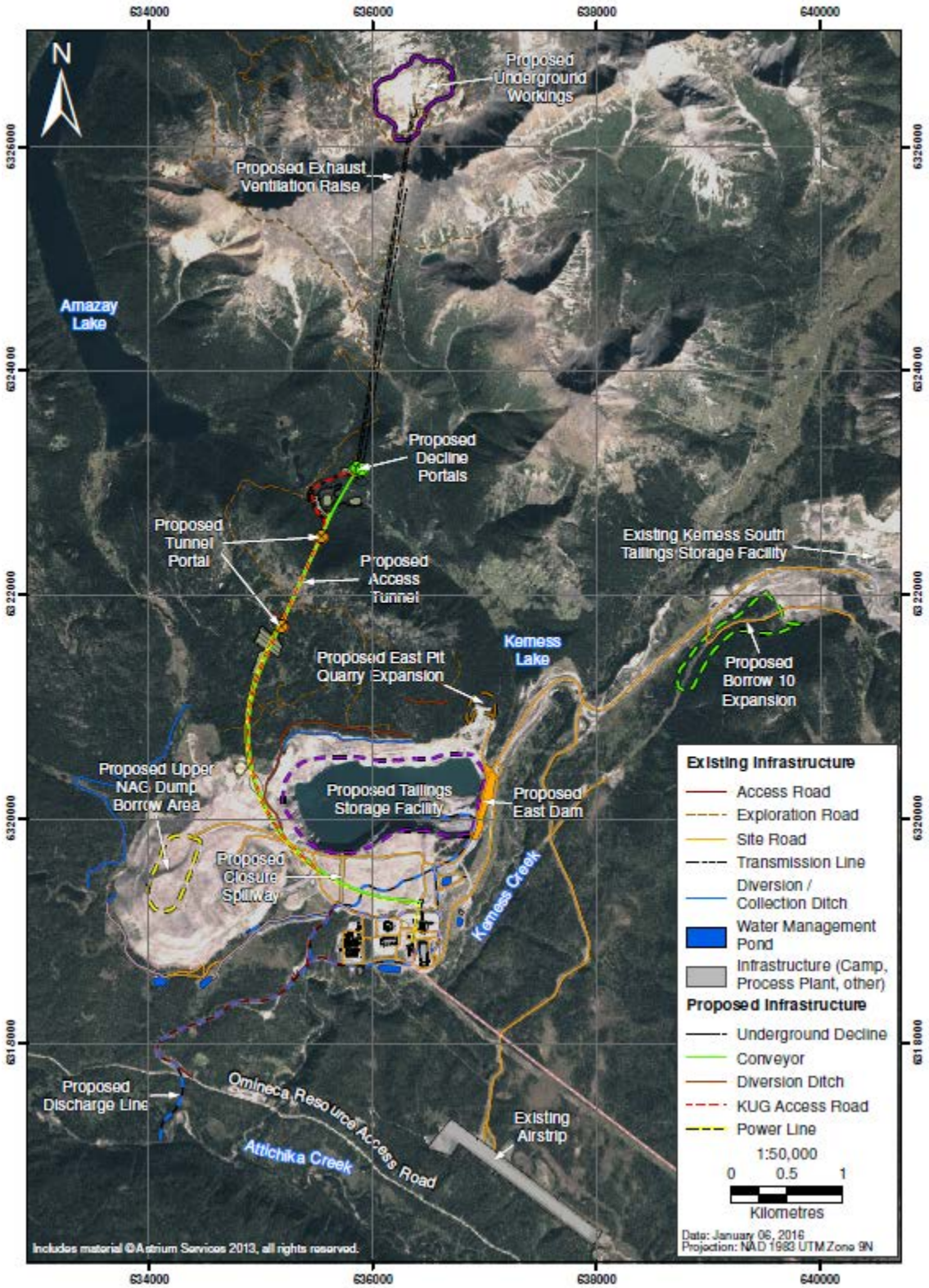
In the years leading up to depletion of the KS deposit, the mineral lease holder of the Kemess property at the time, Northgate Minerals Corporation, made plans to extend operations by developing the Kemess North Mine (KN) deposit. The proposed extension included development of a new open pit, a new tailings and waste rock storage facility in Amazay Lake, and modification of the existing processing plant and related infrastructure. The proposed KN Project underwent a federal and provincial EA by panel review in 2007. The panel indicated that there would be significant adverse environmental, social and cultural effects that outweighed the economic and social benefits and recommended that KN not be approved as proposed. Both the federal and provincial governments accepted the recommendations of the panel, and invited Northgate Minerals to submit an alternate project design for development of the deposit. The proposed development of the KUG deposit by means of an underground mine with limited area of new surface disturbance addresses the concerns raised during the KN panel review.

The KUG Project would use a combination of new and existing infrastructure and improvements from KS for the mine life. It would use the following infrastructure from the KS Project: process plant, KS open pit (which will serve as the tailings and waste rock storage facility for the KUG Project), electrical supply network, water management ponds, pumps and water lines, onsite access roads, and onsite administrative, service, and accommodation facilities. The KUG Project would also use the existing airstrip, transmission line, road access to the site via the ORAR, and load out facility at Mackenzie.

The KUG Project includes the following new proposed infrastructure and activities:

- underground infrastructure (decline tunnels, panel cave gallery, crushers, ventilation system and exhaust raise, underground conveyor, electrical network including substation, explosives magazines, water sumps and pumps, garages, warehouse, refuge and storage areas);
- underground activities (blasting, undercutting, ore extraction, crushing and transport and operational dewatering);
- surface portal infrastructure and activities (construction office, stockpiles, construction laydown areas, fuel storage, electrical distribution and water handling infrastructure);
- surface infrastructure including a concrete-shotcrete batch plant;
- surface infrastructure and activities connecting the underground and KS areas (ventilation access road, access corridor including an access road and a tunnel from the triple decline portal area to the KS mill stockpiles, and power line); and
- tailings storage facility (TSF; KUG Project TSF).

Figure 2: General Project Arrangement



As part of the KUG Project, AuRico would construct an access corridor between the existing KS facilities and the underground deposit area, comprised of an upgraded and extended road, 865 metre (m) access tunnel, surface conveyor, dewatering pipeline and transmission line. The corridor would provide access to the portals of three declines for: access (personnel, equipment and materials); an ore conveyor; and a ventilation intake airway.

Ore would be mined using panel caving, which is an approach that undercuts orebodies and allows the ore to cave under its own weight. AuRico predicts that this would create an area of surface subsidence. Mining would occur in an area measuring approximately 540 m long and 150 - 350 m wide. The underground mine would include tunnels on three levels, connected to the surface via three declines. The ore would be crushed by multiple underground crushers, and then transported to the existing ore stockpile north of the KS processing plant via conveyors.

The ore would be processed using the existing KS processing facility. The KUG Project would use the KS pit as a TSF to store the approximately 107 Mt of tailings and 3 Mt of potentially acid generating (PAG) waste rock predicted by AuRico. All waste rock from the declines and cave zone would be treated as PAG and put in the KUG Project TSF. AuRico would try to segregate waste rock from the access tunnel if possible, and all PAG from that process would go to the KUG Project TSF. A 25 m high dam would be built to accommodate the predicted waste products in the KUG Project TSF. Concentrate would be transported by truck along the ORAR to the existing load out facility at Mackenzie, after which point it would be transported by rail using the existing rail network.

Mine contact water would report to the KUG Project TSF. AuRico would build selenium (Se) and dissolved metal treatment plants within the existing KS disturbance area for use at various stages in the mine life. Water would be discharged to Attichika Creek until the end of the closure stage. In the post-closure stage, AuRico would discharge via a spillway to Waste Rock Creek.

AuRico states that new surface disturbance from the KUG Project would be less than 100 hectares (ha), which includes a 35 ha subsidence zone above the ore deposit.

1.2.4 Alternative Means of Undertaking the KUG Project

The Application includes a comparative evaluation of alternative practical means of implementing and carrying out various aspects of the KUG Project, consistent with paragraph 19(1)(g) and paragraph 34(1)(a) of CEAA 2012. Under CEAA 2012, alternative means considered in a project EA must be technically and economically feasible. The project EA must address environmental effects as defined under section 5

of CEAA 2012 for each of these alternative means. In addition to fulfilling legislative requirements, EAO considers this evaluation and its subsequent conclusions to be part of the process by which adverse effects from a project are avoided (i.e., mitigation by design).

In response to the Mount Polley Independent Expert Engineering Investigation and Review Panel's (Independent Panel) report on the tailings facility breach at that mine[2], on March 19, 2015, EAO set out additional requirements for the alternatives assessment for any proposed conventional TSF.

The specific alternative means that were evaluated included the following:

- Mining method (open stoping, sublevel caving or panel caving extraction methods);
- Electrical power source;
- Rock haulage (e.g., truck haulage versus conveyor);
- Underground access - portal locations;
- Underground access - access corridor;
- Tailings and waste rock management; and
- Water management, including pit water discharge options.

AuRico evaluated alternative means using the following general approach:

- Screening assessment of alternatives using technical and economic criteria;
- Evaluation of potential effects on the human and natural environment of resulting alternatives (the Application's VCs – see Table 3 below); and
- Use of performance objectives and ratings to compare alternatives.

A summary of AuRico's conclusions from the alternatives assessment is provided below. Further details of the alternatives assessment, including the performance objectives and ratings are in Chapter 4 of the Application.

Mining Method

AuRico concluded that open stoping and sublevel caving mining methods are considered unacceptable for the KUG Project based on economic performance objectives, whereas panel caving provides an acceptable return on investment and therefore is the preferred mining method.

Electrical Power Source

There is an existing 380 km, 230 kilovolt (kV) power line from BC Hydro Kennedy

[2] Information on the Independent Review Panel and the full report are available at the following site: www.mountpolleyreviewpanel.ca/.

substation with power distribution to existing plant (KS) that is owned by AuRico. The line is in use for care and maintenance of KS and agreements are in place to provide sufficient power to start of the KUG Project development. Back-up diesel generators are also in place. For this reason AuRico did not consider alternative energy sources for the KUG Project further.

Rock Haulage

There is no economically viable alternative to a conveyor for moving ore from the portal to the processing facility. Although there is a capital cost of $31.5 M and additional costs for decommissioning at closure for the approximately 8 km long conveyor system, the operating costs are significantly less than for trucking and therefore conveying is AuRico's preferred alternative. An additional benefit of the conveyor system is the overall reduction in GHG emissions compared to a trucking scenario.

Portal Location

AuRico considered three portal locations to access the KUG Project deposit. The Amazay Lake location was deemed "challenging" because of First Nations' concerns and recent history regarding the proposed use of this watershed for mine waste disposal (as raised during the KN EA). The North Kemess Creek Valley option was considered inefficient and too costly because of the distance from the processing facility and need for the access corridor to cross a number of creeks that would potentially affect fish habitat, wildlife habitat and surface hydrology more than the other options. First Nations' concerns around using undisturbed areas for mining activities also make this option "challenging".

AuRico concluded that the Kemess Lake Valley is the preferred portal location. Despite having the longest decline length of the options considered, it is more energy efficient as there is less vertical lift from the orebody to surface. There are no creeks to be crossed, it is closest to the ore processing facility and has the smallest surface footprint compared to the other options. This option is also preferred by TKN.

Access Corridor

Two potential access corridor routes to the mine portal were assessed: the Kemess Lake Valley corridor option and the West of Pit corridor option. The Kemess Lake Valley corridor traverses steeper terrain and has potential terrain hazards. Potential environmental effects from erosion and sedimentation of adjacent aquatic habitat and potential effects to archaeological sites make this option "challenging".

The West of Pit corridor does not cross any streams and uses existing roads so there would be reduced effects on terrain and soils. An 865 m-long tunnel through a steep

ridgeline to access the portal location is required and reduces the surface footprint. The tunnel may have local groundwater effects but these are considered not significant. The West of Pit corridor is the preferred mine access corridor route based on the lower cost, reduced terrain hazard and “acceptable” environmental effects.

Water Management

AuRico has completed a detailed assessment that included engagement and consultation with TKN to determine the preferred discharge alternative for the KUG Project. Six alternatives were initially considered from which two were selected for detailed characterization and assessment. A qualitative approach was taken in rating the technical, environmental, human environment, project economics, and regulatory environment implications of the Attichika Creek and Thutade Lake options.

Both options were rated similarly for their environmental implications. Attichika Creek is preferred for human environment and regulatory considerations and Thutade Lake is preferred for technical and project economic considerations. KUG Project economics were set aside as the estimated costs are acceptable to AuRico. Hence the Attichika Creek option has a greater number of accounts with a preferred rating and, therefore, was assigned as the overall preferred alternative. This option is also preferred by TKN.

Alternatives Assessment for Tailings and Waste Rock Disposal

Compared to other aspects of the KUG Project, the alternatives review for tailings and waste rock management is summarized in the most detail as this was a specific requirement of EAO. EAO required that proponents, including AuRico, assess options for tailings management that considers technology, siting and water balance. This assessment must include consideration of best practices and Best Available Technologies (BAT) for tailings management for the project, along with options for managing water balance to enhance safety and reduce the risk of a tailings dam failure during all phases of mine life.

The details of AuRico’s tailings alterative assessment are in Appendix 4-C of the Application. The assessment included 27 initial tailings alternative options that were pre-screened for “absolute” project requirements (i.e., issues that could prevent or seriously delay the project from proceeding) and then subsequently ranked for technical criteria[3]. From this process, the following top seven ranked options were brought forward for further evaluation:

[3] The absolute requirements used in the pre-screening are the following: adequate storage capacity; avoidance of deposition of tailings in fish habitat; within the Proponent’s mineral claims; public and worker safety; and avoidance of locations or technologies where ML and ARD cannot be effectively mitigated.

1. Conventional (slurry; approximately 35% solids by weight) tailings storage in KS open pit – new 25 m dam;
2. Conventional tailings storage in existing KS TSF – raise existing dam by 20 m;
3. Conventional tailings storage split between KS open pit and KS TSF – no new dam;
4. Conventional tailings storage at Greenfields site near existing airstrip ("site M").
5. Filtered (dry stack) tailings storage at site M;
6. Split tailings storage with conventional tailings in KS open pit and filtered tailings on top of KS non-acid generating dump; and
7. Split tailing storage with conventional tailings in KS open pit and cemented paste[4] storage at site M.

AuRico then compared the above seven options using weighted criteria that looked at the technical aspects of each option (e.g., dam safety, closure security, see Table 4.2-1 in Appendix 4-C) and potential implications for each of the KUG Project VCs (see Table 4.4-1 in Appendix 4-C). The costs of the options were then evaluated after the ranking of alternatives on technical, human and environmental criteria (see Table 7-1 of Appendix 4-C).

The multi-stepped alternatives assessment conducted by AuRico identified option 1 above (conventional tailings in the KS pit) as the preferred alternative. This option has the advantage of storing all PAG materials below water; however, it does include a small dam (with associated potential long-term stability and maintenance concerns). Option 6 was also ranked highly in the assessment although it would have higher relative costs for the filtration plant and involve significant maintenance and ongoing support, contributing to a full life cycle cost that was approximately twice that of option 1.

AuRico concluded that the risk and consequences of dam failure for option 1 was lower than other alternatives that require raising or construction of dams for conventional tailings containment (options 2 and 4) because the total dam size is smaller with good foundation conditions, the quantity of stored tailings for release is less and the dam situation facilitates a design that enhances long-term safety. A catastrophic failure of the KUG Project East Dam (option 1) would be expected to result in bulk tailings deposition into Kemess Creek and could affect water quality, erosion and sedimentation downstream into Thutade Lake. Aquatic and riparian communities in and along Kemess and (lower) Attichika creeks and downstream into Thutade Lake could be impacted. Further details on effects to VCs and EAO's significance analysis of a KUG TSF East Dam failure is provided in section 7.

[4] Cemented paste tailings have a higher percentage of solids than conventional tailings; minimal separation of water and solids occurs when the paste is deposited into a storage area.

Please see s.4.3.6 and Appendix 4-C of the Application for further details of the Alternatives Assessment for Tailings and Waste Rock Disposal.

During Application review, comments were received from TKN on the tailings alternatives assessment, TSF design and the potential for TSF dam failure. These comments are addressed in the discussion of potential accidents and malfunctions associated with the KUG Project in section 7 of this report.

1.2.4.1 *EAO's Analysis*

In reviewing AuRico's alternatives assessment, EAO referred to the recommendations of the Independent Panel report and also a subsequent letter sent to Honourable Bill Bennett, Minister of Energy and Mines from an Independent Panel member, Dr. Dirk Van Zyl[5].EAO notes that the Independent Panel recommended the use of BAT for tailings storage. The Independent Panel provided a number of examples of BAT, some of which include storage of filtered tailings, the use of tailings as backfill, a reduction in the use of water covers in a closure setting and storing tailings below ground in mined out pits. Dr. Dirk Van Zyl's letter emphasized that due to the varied geology, topography and climate of BC, considerations for selecting a tailings management option require site specific measures. The outcome of a stable and resilient tailings deposit should be the number one design priority and there is no one recommended BAT technology.

The Independent Panel also recommended that applications for a new TSF be based on a feasibility analysis that considered all technical, social and economic aspects of the project in sufficient detail to support an investment decision. They recommended this analysis include:

- A detailed evaluation of all potential failure modes and a management scheme for residual risk;
- Detailed cost/benefit analysis of BAT tailings and closure options; and
- A detailed declaration of Quantitative Performance Objectives.

Considering the information presented by AuRico in the alternatives assessment, EAO finds AuRico's plan for tailings storage in the KS open pit to be consistent with the Independent Panel recommendations. EAO also finds the feasibility analysis to meet the requirements described above. EAO is satisfied that AuRico has reasonably considered the alternatives for the above components of the KUG Project with a regard to economic and technical feasibility, and potential impacts on VCs. EAO also notes that updates made on July 20, 2016 to the TSF requirements (Part 10) of the Health, Safety and Reclamation Code for Mines in BC (Mining Code), which include design and

[5] The letter dated August 18, 2015 is available from the MEM website.

operations requirements for water management and seismic issues, would set a high standard of safety for the KUG Project TSF. These changes are discussed further in section 7 of this report.

2. Overview of the Environmental Assessment Process and Outcomes

Table 1 below provides a summary of the key milestones in the Pre-Application and Application Stages of the EA.

Table 1: Environmental Assessment Milestone Summary

Date	Milestone
February 7, 2014	EAO issued a section 7 Order, designating the KUG Project reviewable.
February 18, 2014	EAO issued a Section 10 Order, initiating the EA
February 19, 2014	EAO requested to the Agency that the BC EA process be a substitute for the CEAA 2012 process
April 8, 2014	The federal Minister of the Environment granted substitution of the federal EA for the KUG Project and posted the substitution approval notice
May 14, 2014	EAO issued a Section 11 Order, defining the scope of the KUG Project and the procedures and methods for conducting the review
June 23, 2014	EAO issued a Section 13 Order adding KwN to Schedule B of the Section 11 Order
November 19, 2014	EAO issued a Section 13 Order to add a public comment period for the VC Scoping Document
November 26, 2014 – January 5, 2015	41 day public comment period on VC Scoping Document
January 11, 2016	EAO approved the final AIR
March 3, 2016	AuRico submitted an Application for evaluation
April 4, 2016	EAO granted a 20 day extension for the evaluation of the Application in response to AuRico's request for additional time to respond to information requests
April 22, 2016	EAO determined the Application contained the information required by the AIR. EAO indicated the Application review period would commence when AuRico provided a final Application. At the same time, EAO provided its assessment of the past/present Aboriginal Consultation activities and Public Consultation activities
May 11, 2016	The Application review began; AuRico submitted its

Date	Milestone
	Application for an EAC to EAO after distributing it first to Working Group members, including Aboriginal groups on Schedule B of the Section 11 Order
May 18–June 17, 2016	A 30-day public comment period on the Application
June 6-7, 2016	EAO participated in KwN Community Meetings, including an open house, in Fort Ware, BC
June 29, 2016	EAO participated in TLFN Community Meetings in Takla Landing, BC
July 28, 2016	AuRico submitted its Day 30 Aboriginal Consultation Report
August 4, 2016	Timeline of the KUG Project EA suspended under Section 24(2) of the Act for 56 days to allow time for TKN community engagement
August 19, 2016	AuRico submitted its Public Consultation Report and final Public Comment Tracking Table
October 16, 2016	AuRico submitted draft Day 100 Aboriginal Consultation Report
December 14, 2016	AuRico submitted final Day 100 Aboriginal Consultation Report
December 21, 2016	AuRico submitted its final Aboriginal Groups (TKN and HRFN) and Working Group Issues Tracking Tables
December 21, 2016	EAO issued a Section 13 Order to reflect changes to the project scope, additional public comment periodon the draft Assessment Report and proposed conditions and additional measures for consultion and accommodation of Aboriginal groups
January 11 – February 10, 2017	A 30-day public comment period on the draft Assessment Report and draft conditions of an EAC and federal conditions of a Decision Statement
February 16, 2017	Timeline of the KUG Project EA extended under Section 24 to allow time for the public comment period on the draft Assessment Report and conditions
February 16, 2017	EAO refers the KUG Project to Ministers for decision on whether to issue an EAC

2.1 Public Consultation

EAO held the following three public comment periods during the EA:

- A 41-day public comment period from November 26, 2014, to January 5, 2015, on the draft Valued Components (VC) Scoping Document. EAO did not receive any public comments during this period.
- A 30-day public comment period from May 18 to June 17, 2016, on the Application. One public comment was submitted. Table 2 below identifies the issues raised in the public comment, where in this report the issue is discussed, and EAO's conclusion regarding the issue.
- A 30-day public comment period from January 11 to February 10, 2017, on the draft Assessment Report, draft conditions of an EAC and draft federal conditions of a Decision Statement. In total, seven submissions were received, including three on the whole package of documents and four on the federal conditions from AuRico, Ministry of Environment (ENV), Ministry of Forests, Lands and Natural Resource Operations (FLNRO) and Ministry of Energy and Mines (MEM), which were sent to the Agency for their consideration.

Table 2: Summary of Issues Raised during the Public Comment Period on the Application and on the Draft Assessment Report and Conditions, Discussion of Issues in this Report and EAO's Conclusion

Issue Raised by the Public	Where Issue is Discussed	EAO Conclusion
Concerns about water quality (particularly Amazay and Thutade lakes)	Section 3.3, Water	The KUG Project was designed (redesigned from KN) to have no effects to Amazay Lake due to its cultural importance to TKN. EAO has proposed a condition for monitoring of Amazay Lake including water quality of Amazay Lake and groundwater monitoring to detect groundwater movement from the underground cave/subsidence zone towards Amazay Lake. EAO has proposed a condition for a Fish and Aquatic Effects Monitoring Plan to monitor concentrations of bioaccumulative contaminants in bull trout in Thutade Lake.
Health and safety of workers	Section 5, Health	No residual effects to health were identified. The mine would be operated in accordance with the Mining Code and Worksafe BC. EAO has proposed a condition for an Air Quality Management Plan to monitor air quality and mitigate potential effects, including from dust.

Issue Raised by the Public	Where Issue is Discussed	EAO Conclusion
Roads through Aiken Lake	Public Issues Tracking Table, Section 3.5, Wildlife	The scope of the EA included a qualitative effects assessment of wildlife effects along the ORAR (through Aiken Lake). EAO has proposed management and monitoring measures specific to the portion of the ORAR where AuRico is currently the sole industrial user as part of the Wildlife Management and Monitoring Plan.
Contamination from TSF	Sections 3.3 and 7, Water and Accidents and Malfunctions	EAO has proposed a condition for water treatment of the effluent from the TSF for metals and Se and a condition to ensure the discharge from the TSF to Waste Rock Creek would not incrementally increase Se concentrations in Waste Rock Creek during post-closure.
Concerns raised by Gitxsan *wilp* Nii Kyap (Gitxsan) regarding water usage and disposal, fish compensation and water quality in Gitxsan territory and concerns raised by MNBC regarding water and fish	Section 3.3, Water and 3.4 Fish	EAO has proposed a number of conditions to address concerns around water quality and fish. Considering EAO's proposed conditions and the MA and EMA permit application requirements, EAO is satisfied the KUG Project would not have a significant adverse effect on water quantity, quality and fish.
Concerns raised by Gitxsan regarding capacity funding, opportunities for employment, partnership agreements and revenue transformation,	Part C, Section 12.1.4	EAO considers consultation of Gitxsan regarding the KUG Project to be adequate and concludes that the KUG Project is not expected to impact Gitxsan's Aboriginal Interests, including culturally significant sites identified at Amazay Lake and Thutade Lake.

Issue Raised by the Public	Where Issue is Discussed	EAO Conclusion
meetings with other First Nations, reclamation of KS and consideration of Gitxsan land use plan.		
Concerns raised by MNBC on the potential in increase chemical hazards posed to wildlife by the KUG Project	Section 3.5 Wildlife and Section 5 Human Health	EAO did not predict a residual adverse effect to wildlife from contaminants of potential concern (COPC) or to human health from the KUG Project (which included consideration of country foods). However, EAO recommends a follow-up program including monitoring to verify AuRico's predictions in the EA and track any potential increases in COPC concentrations in the environment and inform additional mitigation, if necessary, in order to satisfy the requirements of CEAA 2012 with respect to avoiding adverse environmental effects of the KUG Project on Aboriginal health.
Concerns raised by MNBC regarding economic, social and cultural needs of MNBC and conserving biological diversity and the rights and traditional land uses of Métis citizens	Part C, Section 12.3.4	EAO concludes that the KUG Project is not expected to impact MNBC's traditional land uses.
The KUG Project has the potential to provide important regional and provincial	Summary Assessment Report, section 10-Economic Benefits	EAO is of the view that the construction and operation of the KUG Project would provide economic benefits to the province of BC.

Issue Raised by the Public	Where Issue is Discussed	EAO Conclusion
economic benefits to the citizens of BC, including employment and tax revenue		

Public comments from the Application review comment period and AuRico's responses are posted on EAO's website at: https://projects.eao.gov.bc.ca/p/kemess-underground/docs?folder=75

2.2 Assessed VCs

The EA focused on specific VCs to assess and to understand the potential for adverse effects of the KUG Project. The application of best management practices and mitigation measures proposed in the Application and supplemental information, and conditions that were developed during Application review would reduce potential residual effects. VCs that may relate to TKN or other Aboriginal groups and the potential for the KUG Project to impact their Aboriginal Interests are discussed in Part C due to their linkages to Aboriginal consultation.

Table 3 lists the VCs that were assessed and indicates where they are discussed in more detail in this report.

Table 3: Assessed VCs in this Report

EA Pillar	Subject Area	VC in Application	Assessment Report Section
Environment	Climate Change	GHG Emissions	3.2
	Hydrogeology	Groundwater Quantity	3.3
		Groundwater Quality	
	Surface Hydrology	Surface Hydrology	
	Surface Water Quality	Surface Water Quality	
	Terrain and Soils	Terrain Stability	3.6
		Soil Quantity	
		Soil Quality	
	Terrestrial Ecology	Ecosystems (Alpine and Parkland; Forested; Wetland; Red and Blue-listed)	

EA Pillar	Subject Area	VC in Application	Assessment Report Section
		Harvestable plants; Rare plants and lichens and associated habitat	
	Fish and Aquatic Habitat	Adfluvial bull trout; Dolly Varden; Rainbow trout	3.4
		Periphyton; Benthic invertebrates	
		Sediment Quality	
	Wildlife	Woodland caribou Mountain goat Moose Grizzly bear Hoary marmot Furbearers (using American marten and wolverine) Migratory landbirds Migratory waterbirds Raptors Bats Western toad	3.5
Economic	Economic	Aboriginal labour market conditions; Non-Aboriginal labour market conditions	4
Social	Social	Community well-being; Aboriginal community well-being	
Health	Human Health	Human Health	5
Heritage	Heritage Resources	Physical and cultural heritage resources; Paleontological resources	6
CEAA 2012 5(1)(c)	Effects of changes to the environment on Aboriginal peoples	Health and socio-economic conditions; Physical and cultural	10

EA Pillar	Subject Area	VC in Application	Assessment Report Section
		heritage; current use of lands and resources for traditional purposes (CULRTP); Any structure, site or thing of historical, archaeological, paleontological or architectural significance	

Residual Effects Characterization

Appendix 1 presents a table defining the characterization ratings used for evaluating residual effects on VCs discussed in this Assessment Report including context, magnitude, extent, duration, frequency and reversibility.

2.3 Issue Summary

Issues raised by the Working Group, TKN, public and AuRico's responses can be found on EAO's website. Table 2 above summarizes public issues raised during Application Review. Working Group comments can be found in the Agency Tracking Table and the First Nations Tracking Table posted at: https://projects.eao.gov.bc.ca/p/kemess-underground/docs?folder=43

Table 4 below presents a summary of key issues raised during Application review and where these issues are discussed in this report, as well as EAO's assessment and conclusions including proposed conditions.

Table 4: Summary of Key Issues and EAO Response/Conclusion

Section of Assessment Report	Summary of EAO's Assessment and Conclusions	EAO's Key Proposed Conditions
Environmental Effects		
Air Quality (s. 3.1)	The Application identified that the primary sources of air emissions would be from the generation and airborne transport of fugitive dust particles and exhaust emissions due to equipment use. Emissions from the KUG Project would be regulated by a permit under the *Environmental Management Act* (EMA). The predictive modelling for air quality for the KUG Project produced contaminant concentrations that were all below the applicable federal and provincial air quality criteria, and these predicted air contaminant concentrations were used as inputs in the evaluation and assessment of other VCs. Issues related to the uncertainty in the amount of dust that would be generated by KUG Project components and the potential for air quality impacts from dust. Other air quality issues specifically related to human health are discussed in the Human Health section of this report.	Condition 27 would require AuRico to develop an Air Quality Management Plan to monitor air quality and mitigate potential effects, including from dust.
Climate Change (s. 3.2)	A separate GHG Assessment Report (GHG Report) was submitted as a supplement to the Application. The majority of GHG emissions would arise from land clearing, stationary fuel combustion, fugitive emissions, and on-site transportation. The GHG Report predicts that total GHG emissions are estimated to be only a very small fraction of BC's estimated total GHG levels (2014) –	Condition 27 would require AuRico to develop an Air Quality Management Plan to implement mitigation measures to reduce GHG emissions.

Section of Assessment Report	Summary of EAO's Assessment and Conclusions	EAO's Key Proposed Conditions
	less than 0.1%, and of Canada's estimated levels – less than 0.01%. AuRico will have GHG reporting requirements to both the federal and provincial governments. Having regard to BC's Climate Action Plan, which includes the Carbon Tax that will apply at the start of the KUG Project, and considering EAO's proposed condition for an Air Quality Management Plan, EAO is satisfied that the KUG Project is not likely to have significant adverse effects related to climate change.	
Water (s. 3.3)	The KUG Project could impact the water VCs through a variety of activities, such as: the development of decline access tunnels; panel cave development and mining; discharging excess water from the KUG TSF; excavating and exposing PAG material; and flooding of the cave in closure and post-closure. Surface water quality could be additionally impacted by erosion and sedimentation, nitrogen (N) loading from explosives and atmospheric dust deposition from various mining activities and equipment use. The KUG Project could potentially impact the following watercourses and water bodies in proximity to the proposed mine due to the above noted activities: Attichika, Attycelley, East Cirque, Central Cirque, Kemess, North Kemess, South Kemess and, Waste Rock creeks; Finlay River; Amazay and Thutade lakes.	Condition 20 would require monitoring water quality of Amazay Lake and groundwater monitoring to detect groundwater movement from the underground cave/subsidence zone towards Amazay Lake. Condition 21 would require AuRico to stage discharge from the TSF to Attichika Creek on a monthly basis to a volume proportional to the Attichika Creek monthly streamflow and restrict discharge to the open water months. Condition 16 would require AuRico to treat the effluent from the TSF for metals and Se to meet BC Water

Section of Assessment Report	Summary of EAO's Assessment and Conclusions	EAO's Key Proposed Conditions
	Key issues raised during the EA for water quality related to the groundwater divide between the cave subsidence zone and Amazay Lake, decline plugs, mine dewatering, geochemical source terms and water treatment. Considering EAO's proposed EAC conditions and the *Mines Act* (MA) and EMA permit application requirements, EAO is satisfied that the KUG Project would not have a significant adverse effect on water.	Quality Guidelines (WQG) or Science-Based Environmental Benchmarks (SBEB). Condition 19 would require AuRico to ensure that discharge to Waste Rock Creek from the TSF during post-closure would not incrementally increase Se concentrations in Waste Rock Creek. The installation of decline plugs at closure is described in the Certified Project Description (CPD). Condition 13 would require AuRico develop a Construction EMP, which would include requirements for sediment and erosion control measures.
Fish and Aquatic Habitat (s. 3.4)	Fish and aquatic habitat have the potential to be affected by the KUG Project during all phases as the KUG Project area encompasses several fish-bearing and non-fish-bearing streams, rivers, and lakes providing fish and aquatic habitat. Fish species provide an important food source for First Nations in the Regional Study Area (RSA). Potential effects to fish and aquatic habitat are related to project activities, specifically road and pipeline	Condition 22 would require AuRico to develop a Fish and Aquatic Effects Monitoring Plan to monitor concentrations of bioaccumulative contaminants in bull trout in Thutade Lake. Condition 19 would require AuRico to ensure that Se concentrations of the

Section of Assessment Report	Summary of EAO's Assessment and Conclusions	EAO's Key Proposed Conditions
	construction, water treatment, TSF dewatering, effluent discharge and outflow from the Se collection pond (SeCP). Key issues that arose during the EA related to AuRico's assessment of fish and aquatic habitat included the initial dilution zone (IDZ) in Attichika Creek and fish monitoring requirements. Considering EAO's proposed EAC conditions and the EMA permit application requirements, EAO is satisfied that the KUG Project would not have a significant adverse effect on fish and aquatic habitat.	discharge to Waste Rock Creek from the TSF during post-closure would not incrementally increase Se concentrations in Waste Rock Creek. Condition 23 would require AuRico to engage with TKN on the design of the effluent diffuser to show how it minimized the length of the IDZ, and implement mitigation measures for any observed adverse effects of the IDZ on fish habitat use.
Wildlife (s. 3.5) • Woodland caribou • Moose • Mountain goat • Grizzly bear • Furbearers • Hoary marmot • Bats • Raptors • Migratory waterbirds • Migratory landbirds • Western toad	EAO identified that the KUG Project would adversely impact wildlife by causing habitat loss and alteration, disruption of movement, sensory disturbance, the introduction of attractants and direct and indirect mortality. Issues raised during the EA included the availability of baseline data, lack of model verification, thresholds for residual effects and potential impacts to caribou. With the proposed EAC condition, EAO is satisfied that the KUG Project would not have significant adverse effects on wildlife. EAO recognizes that there is a degree of uncertainty regarding potential impacts from the KUG Project on caribou due to incomplete information on caribou	Condition 25 would require AuRico to develop a Wildlife Monitoring and Management Plan, which would address effects to wildlife, alpine species, birds, bats, caribou and effects along the ORAR. Condition 26 would require AuRico to enter into an agreement with FLNRO regarding AuRico's participation in a program of activities that supports the conservation and management of caribou in the KUG Project area.

Section of Assessment Report	Summary of EAO's Assessment and Conclusions	EAO's Key Proposed Conditions
	population trends, habitat use and predator dynamics in the region. However, EAO is satisfied that these uncertainties can be addressed by the mitigation measures in the proposed conditions related to caribou management and monitoring plan, and concludes that residual effects to caribou would not be significant.	
Terrestrial Environment (s. 3.6) Terrain and Soils: • Terrain stability • Soil quantity • Soil quality Terrestrial Ecology: • Alpine and parkland ecosystems • Forested ecosystems • Wetland ecosystems • Red- and blue-listed ecosystems • Rare plants and lichens and associated habitat • Harvestable plants	EAO identified the increased risk of geohazards due to subsidence and to footprint development in unstable or erodible terrain; loss of soil in subsidence area and under retained roads; and loss of soil quality in subsidence buffers, retained road buffers, and in reclaimed areas as residual effects to terrain and soils as a result of the KUG Project. In total, 46 ha of soil is expected to be permanently lost. EAO identified direct and indirect effects including loss and alteration of harvestable plant habitat; loss of alpine and parkland ecosystem extent and function; alteration of alpine ecosystem function due to subsidence; loss of forested ecosystems through surface clearing and permanent infrastructure; and alteration of forested ecosystems through edge effects, on harvestable plants, alpine and parkland ecosystems, and forested ecosystems. An estimated 0.2 ha of wetland would be lost. Considering the proposed condition and mine site	Condition 24 would require AuRico to develop a Wetlands Management and Monitoring Plan as part of the Ecosystems Management Plan. Condition 13 would require AuRico develop a Construction EMP, which would include requirements for sediment and erosion control measures.

Section of Assessment Report	Summary of EAO's Assessment and Conclusions	EAO's Key Proposed Conditions
	reclamation required for the KUG Project, EAO is satisfied that the KUG Project would not have significant adverse effects on the terrestrial environment.	
Socio-Economic Effects (s. 4) • Aboriginal labour market conditions • Non-Aboriginal labour market conditions • Community well-being • Aboriginal community well-being	Loss of employment at closure, and competition for skilled labour and wage inflation during construction and operations phases are expected to have a residual economic effect. The Aboriginal labour market may face disproportionately greater challenges finding new employment after mine closure. The impact of in-migration of workers to northern communities and transportation hubs, such as crime rates, cost of living, drug use and childcare availability, was a key concern discussed in the EA. Considering the proposed EAC conditions, EAO is satisfied that the KUG Project would not have significant adverse effects on social or economic conditions.	Condition 30 would require AuRico develop a Socio-community and Economic Effects Management Plan to describe AuRico's plans for communicating and engaging with the community; the process for issues management; and the means by which the mitigations proposed by AuRico, would be implemented. Condition 29 would require AuRico develop a Health and Medical Services Plan (HMSP) conforming to Northern Health's "Health and Medical Services Plan Best Management Guide for Industrial Camps".
Human Health Effects (s. 5) • Noise • Air Quality • Drinking water quality	The KUG Project would generate noise and release pollutants into the air, soil and water possibly impacting human health. Drinking water, particulate matter (PM) exposure, metals in dust, exposure to COPC in country foods and the conservativeness of estimates within the Human Health Risk Assessment (HHRA) were the key	Condition 27 would require AuRico develop an Air Quality Management Plan with mitigation measures to reduce PM levels. Condition 28 would require AuRico to provide details to Northern Health on

Section of Assessment Report	Summary of EAO's Assessment and Conclusions	EAO's Key Proposed Conditions
• Country foods quality	issues identified by EAO. With the proposed EAC conditions, EAO is satisfied that the KUG Project would not have a significant adverse effect on human health.	potential groundwater effects to inform Northern Health's drinking water permitting process.
Heritage Effects (s. 6)	Only one known archeological site is expected to be impacted by the KUG Project and this site has already been disturbed. EAO is satisfied that no residual effects are expected to heritage resources, including as yet unknown archaeological sites, from the KUG Project after mitigation. AuRico has provided a Heritage Resources Management Plan describing the course of action that would be taken prior to upgrading the road where the disturbed site is located as well mitigation procedures for additional sites, should they be discovered. EAO understands that the procedures, mitigations and other measures proposed in the plan are requirements of the *Heritage Conservation Act* (HCA) and the MA.	None
Accidents and Malfunctions (s. 7)	During construction and operation of the KUG Project, unplanned events could occur that would result in effects to surface water quality, terrain and soils, terrestrial ecology, fish and aquatic habitat, wildlife, human health and CULRTP. Unplanned events could arise from accidents or malfunctions associated with proposed KUG Project activities or from environmental events or processes, which could have adverse effects on the KUG	Condition 17 would require AuRico to develop an Accidents and Malfunctions Communication Plan to ensure the appropriate communication systems are in place to inform Aboriginal Groups, communities and other users of the area in the event of an accident such

Section of Assessment Report	Summary of EAO's Assessment and Conclusions	EAO's Key Proposed Conditions
	Project. Key issues that arose during the EA regarding accidents and malfunctions included potential failure of the KUG TSF East Dam, the analysis methodology for assessing accident risk, engagement with TKN and conditions for EMPs. Considering the likelihood of occurrence and based on the combination of proposed KUG Project design measures, mitigation measures, and proposed conditions, EAO concludes that the KUG Project is not likely to result in significant adverse environmental effects as a result of accidents and malfunctions.	as tailings breach. Condition 18 would require AuRico to develop an Accidents and Malfunctions Administration Plan, which would include requirements for mitigation measures of failure modes of low environmental risk and management of the risk of, monitoring and reporting on accidents along the ORAR.
Effects of the Environment on the KUG Project (s. 8)	Environmental effects and processes have the potential to affect the KUG Project and result in effects to VCs including: climate change, avalanches, landslides, natural seismic and volcanic activity; and lightning and forest fires. KUG Project design and mitigation would lower the likelihood and reduce the severity of effects of the environment on the KUG Project. Considering the implementation of the EMPs and associated plans that are requirements under the MA and the EMA, EAO is satisfied that effects of the environment on the KUG Project are not significant.	None

Section of Assessment Report	Summary of EAO's Assessment and Conclusions	EAO's Key Proposed Conditions
Effects of Changes to the Environment on Aboriginal Peoples Related to CEAA 5(1)(c) (s. 10.3) • Effects On The Health And Socio-Economic Conditions Of Aboriginal Peoples Related To CEAA 2012 5(1)(c)(i) • Effects on Aboriginal Peoples' Physical and Cultural Heritage, and Effects on Historical, Archaeological, Paleontological or Architectural Sites or Structures Related to CEAA 2012 5(1)(c)(ii) and (iv) • Effects on Aboriginal Peoples' CULRTP Related to CEAA 2012 5(1)(c)(iii)	EAO predicts that the KUG Project could cause residual effects to Aboriginal peoples through changes to the environment. The following impacts are predicted: • Quality of experience of using the land base for CULRTP, including cultural areas due to potentially increased human presence in the overall KUG Project region from improved access along the ORAR (due to maintenance and winter clearing); • Perception of country food contamination, which could affect country food consumption and Aboriginal peoples' health and family expenditures through relying on less healthy and more expensive store bought food; • Changes to the availability of plants, wildlife and fish; and • Access restrictions, which would reduce the area of land available for Aboriginal groups to conduct land based activities. Considering the HHRA, which does not predict any residual effects to human health from the KUG Project, proposed EAC conditions to reduce the perceptions of impacts to country foods, and the Economic and Community Development Agreement (ECDA) being negotiated between TKN and the Province, EAO concludes that the predicted residual and cumulative effects to the health and socio-economic conditions of	All conditions related to water quality, fish, wildlife and plants as identified above. Condition 11 would require AuRico to provide training and employment opportunities for individuals from TKN to conduct monitoring at the KUG Project. Condition 19 would require AuRico to ensure that Se concentrations of the discharge to Waste Rock Creek from the KUG Project TSF during post-closure would not incrementally increase Se concentrations in Waste Rock Creek. Condition 12 would require AuRico to establish an Environmental Monitoring Committee with participation from TKN and government agencies to discuss the ongoing development of the KUG Project and mitigation measures in a coordinated and collaborative manner. Issues to be discussed in this committee would include water

Section of Assessment Report	Summary of EAO's Assessment and Conclusions	EAO's Key Proposed Conditions
	Aboriginal peoples would not be significant. Considering EAO's prediction of only one low magnitude residual effect to the quality of experience of cultural places, and with the implementation of key mitigation measures identified by EAO, EAO is satisfied that the KUG Project would not likely have significant adverse residual or cumulative environmental effects on physical or cultural sites (including any structure, site or thing that is of historical, archaeological, paleontological or architectural significance to Aboriginal peoples). In consideration of the non-significant impacts to fish and aquatic habitat, wildlife, caribou and harvestable plants, the likely low magnitude of effects of increased human presence (due to the distance from Mackenzie) and the proposed EAC conditions to mitigate impacts to the perception of contamination and to protect fish and wildlife, EAO concludes that the KUG Project would not have significant residual or cumulative effects on CULRTP with respect to fishing, hunting or gathering.	management and treatment, the KUG Project TSF, water quality monitoring and wildlife management and monitoring. Condition 31 would require AuRico to consult with TKN to identify opportunities for cultural awareness and recognition such as holding ceremonies, recognizing cultural heritage and providing cultural awareness training to KUG Project personnel.

PART B – ASSESSMENT OF POTENTIAL EFFECTS, MITIGATION AND SIGNIFICANCE OF RESIDUAL EFFECTS

3. Assessment of Environmental Effects

3.1 Air Quality

3.1.1 Background

The KUG Project activities would result in air emissions to the ambient environment primarily from the generation and airborne transport of fugitive dust particles and exhaust emissions from equipment use, both underground and above ground. The primary air emissions would be nitrogen oxides (NO_x), sulphur oxides (SO_x), and carbon monoxide (CO) resulting from fuel combustion of vehicles and equipment; and fugitive dust emissions from stockpiles and along the access corridor. TKN have identified a concern around the potential influence from industrial facilities on air quality as a pathway to affect the quality of experience during land-use activities. Point sources of emissions from the KUG Project would be regulated by a permit under EMA.

3.1.1.1 *Description of VC*

For the purposes of the KUG Project, air quality is assessed as a predictive study, meaning the evaluations of air contaminants were used as inputs into an assessment of other VCs including Surface Water Quality (Chapter 11 of the Application), Terrain and Soil (Chapter 12 of the Application), Terrestrial Ecology (Chapter 13 of the Application), Wildlife (Chapter 15 of the Application), and Human Health (Chapter 18 of the Application). The measurement parameters for assessing potential changes to air quality were characterized by nitrogen oxide (NO_x as nitrogen dioxide [NO_2]), sulphur dioxide (SO_2), CO, total suspended particulate (TSP) matter, PM with a diameter less than 10 micrometres (PM_{10}), respirable particular matter with a diameter less than 2.5 micrometres ($PM_{2.5}$), and dust deposition. The predicted concentrations for each contaminant were compared to established federal and provincial Ambient Air Quality Criteria (AAQC) to assess the potential impacts of KUG Project emissions on air quality. However, because air quality is an intermediate component, AuRico did not characterize residual effects or determine significance of effects for air quality as per the AIR. Instead, EAO considers the predicted KUG Project effects to air quality when determining significance to those VCs listed above.

For the construction and operations phase of the KUG Project there are six main

activities that are sources of air emissions that were used to assess the measurement parameters:

- Generators, heaters and fans;
- Mining equipment tailpipe emissions from underground;
- Mining equipment and vehicle tailpipe emissions from surface;
- Unpaved road dust;
- Material handling such as material drop onto stockpiles; and
- Other mining activities, such as bulldozing, grading and stockpiling.

A baseline ('background') concentration was established for each air contaminant to account for existing conditions. These concentrations were added to the predicted model outputs. The Application uses the California Meteorological Model (CALMET) meteorological modelling to process the meteorological information and a California Puff Model (CALPUFF) dispersion model (using CALMET data) to predict concentration and deposition patterns of air contaminants for the construction and operations phases of the KUG Project. The CALMET/CALPUFF modelling results are found in Charter 7.1.6 of the Application and the CALPUFF Contour Plots are found in Appendix 7.1-20.

3.1.1.2 *Study Areas*

The air quality RSA for the KUG Project is 20 km east to west and 30 km south to north, centred at the mill and the subsidence zone areas, shown on Figure 7.1-1 of the Application. The RSA is the model domain where dispersion modelling was conducted. Defining a Local Study Area (LSA) was not required for the purposes of the air quality predictive study.

Refer to Application Chapter 7.1 for detailed descriptions of the assessment boundaries for air quality including maps.

3.1.1.3 *AuRico's Assessment*

The air quality assessment for the KUG Project can be found in Chapter 7.1 of the Application. The Application states that the majority of the emissions generated by the KUG Project would occur in both the construction and operations phases, as the emissions from closure and post-closure phases are expected to be limited and intermittent.

Ambient background concentrations measured at Diavik Diamond Mine (300 km northeast of Yellowknife), Galore Creek Mine (280 km west of the KUG Project), and Kitsault Mine Project (250 km southwest of the KUG Project) were considered for air quality concentrations to form a representative background concentration for the KUG Project area because they were similarly remote areas with few anthropogenic sources.

Background dustfall concentrations from Kerr-Sulphuret-Mitchell Project (KSM) (200 km west of the KUG Project), Galore Creek Mine, Kitsault Mine Project, Brucejack Project (within the same vicinity as KSM, Galore Creek Mine and Kitsault Mine Project), and Schaft Creek Project (245 km west of the KUG Project) were used to develop a representative dust deposition rate for the KUG Project area.

Table 5 shows the maximum predicted concentration from the modelling (with background concentrations added) for each contaminant (SO_2, NO_2, CO, TSP, PM_{10}, $PM_{2.5}$, and dustfall) for both construction and operations. These values were compared to applicable federal and provincial air quality criteria (National Ambient Air Quality Objectives, Canadian Ambient Air Quality Standards, BC Ambient Air Quality Objectives and former BC Pollution Control Objectives) and no exceedances of the most stringent criteria were observed.

In October 2016, AuRico submitted the Feasibility Study Update with respect to the Application for an EAC for the KUG Project (updated feasibility study). This supplement to the Application evaluated potential additional effects to VCs from several changes to the KUG Project that are not contained in the Application, such as increased tailings and waste rock creation. As a result of the updated feasibility study, two changes were made that interact with local air quality conditions: 1) an update to the mobile equipment fleet; and 2) an increase to the tailings and waste rock tonnage amount. The update to the mobile equipment fleet overall is predicted to result in an overall reduction in emissions, and does not have a potential to lead to greater residual effects to any relevant VC. Because these emissions were reduced, the initial modelling results were not updated and can be considered a conservative estimate and are reflected in Table 5. The increase to tailings and waste rock tonnage resulted in higher results for TSP, PM_{10}, and $PM_{2.5}$. The updated values are reflected in Table 5.

Table 5: Predicted Maximum Concentrations during Construction and Operations

				Construction		Operations	
		Concentrations (micrograms/cubic metre [µg/m^3]) and Dust Deposition Rate (milligrams per square decimetres per day [mg/dm^2/day])					
Pollutant	Averaging Period	Objective	Background	Maximum Predicted Concentration (Project)	Maximum Predicted Concentration (Project + Background)	Maximum Predicted Concentration (Project)	Maximum Predicted Concentration (Project + Background)
SO_2	1-hour	200[a]	4	15.4	19.4	19.8	23.8
	24-hour	160	4	4.7	8.7	5.5	9.5
	Annual	25	2.3	0.3	2.6	1.4	3.7
NO_2	1-hour	188[a]	21	132.1	153.1	122.1	143.1
	24-hour	200[b]	21	111.9	132.9	68.6	89.6
	Annual	60[a]	5	10.6	15.6	16.8	21.8
CO	1-hour	14,300[a]	100	200.2	300.2	221.3	321.3
	8-hour	5,500[a]	100	100.0	200.0	88.7	188.7
TSP	24-hour	120[ab]	22	47.9	69.9	25.3	47.3
	Annual	60[ab]	10	4.3	14.3	4.4	14.4
PM_{10}	24-hour	50[a]	3.4	12.8	16.2	13.9	17.3
	Annual	N/A	3.4	N/A	N/A	2.4	5.8
$PM_{2.5}$	24-hour*	25[a]	1.3	2.9	4.2	1.5	2.8
	Annual	8[a]	1.3	0.5	1.8	0.4	1.7
Dustfall	30-day	1.7 to 2.9[c]	0.56	0.1	0.6	0.072	0.63

Note: * Based on annual 98th percentile value.
[a] BC Ambient Air Quality Objectives
[b] Canadian Ambient Air Quality Criteria (NAAQOs/CAAQS)
[c] Former BC Pollution Control Objectives

3.1.1.4 *Mitigation Measures*

The Application identified two main types of mitigation and management measures to reduce air quality impacts associated with the KUG Project: emission reduction measures and fugitive dust reduction measures.

Emission reduction mitigation measures:

- Use emission control measures on point source emissions, such as scrubbers and dust collectors;
- Maintain equipment in proper working order; and
- Institute a non-idling policy for KUG Project vehicles.

Fugitive dust reduction mitigation measures:

- Ensure minesite roads are regularly maintained and kept in good repair;
- Application of water or other commercial dust suppressants to roadways to minimize dust from vehicle traffic, when ambient air temperatures permit;
- Enclosed, negative-pressure housing with fabric-bag collector-system at conveyor transfer points to prevent fugitive dust;
- Limit discharge heights from conveyor belts onto stockpiles;
- Use of dust suppressants, such as water, to reduce dust from waste rock haulage and grading (as needed, and when ambient air temperatures permit); and
- Use of windbreaks around identified problem areas to limit dust emissions from components and activities observed to generate substantive windblown or re-entrained dust.

3.1.1.5 *Other Relevant Projects*

KS was in operation between 1998 and 2011 and is located in the immediate KUG Project area. During operation of KS many of the criteria air contaminants and fugitive dust levels would have experienced elevated levels, but data from this time is unavailable. KS is currently in a care-and-maintenance phase with relatively limited activity on-site.

3.1.2 Discussion of Issues

EAO received review comments on the air quality sections of the Application from the ENV and Environment and Climate Change Canada (ECCC). Additional comments on effects to wildlife that are also relevant to air quality were received from TKN and are discussed in the Wildlife section (section 3.5) of this report. The issues tracking tables includes all of the comments, including those that were for clarification and those that

relate to subsequent permitting. Other air quality issues relevant to Human Health, such as metals bound to PM_{10}, have been discussed in the Human Health section (section 5) of this report.

The main issue EAO identified among these comments was the potential for dust from KUG Project operations to impact air quality, vegetation and wildlife consumers. ECCC requested additional information regarding dust management for ore during transfer to surface and transportation along the conveyor and plans for mitigating air entrainment of ore particles during transport.

AuRico responded that underground dust suppression consists of wetting the rock before it is transported to prevent dust liberation. Water sprays are also installed at locations where rock enters ore/waste passes and/or crushers. Additional water sprays are also installed as needed at transfer points between conveyers. Wetting the rock in this way brings the moisture content of the underground ore and waste rock to between 7-10%, which is sufficient to prevent dust liberation during transport. In addition, the air quality management plan in the Application includes the commitment to limit the discharge heights from the conveyors onto stockpiles, and to use enclosed, negative-pressure housings with a fabric bag collector system at the conveyor transfer points in order to further mitigate fugitive dust along the conveyor. ECCC was satisfied with the information provided by AuRico and EAO considers the issue resolved.

ENV raised concerns regarding dust emissions from the tailings beach, specifically questioning AuRico's assumption that control measures would be 75% effective at controlling dust emissions from this source.

AuRico responded that the figure of 75% efficiency comes from a combination of factors: tailings are added to the storage area in slurry form so the area would be wet and not subject to wind erosion; the tailings beach would not be exposed to mechanical disturbance (e.g., bulldozers and vehicle traffic) that would increase the amount of material that could be readily eroded; and the exposed tailings would be below the rim of the pit, which would provide a wind break.

ENV was not entirely satisfied with this response and of the view that the 75% efficiency assumption was overly optimistic. ENV pointed to the small size of tailings beach material, which could contribute to a continual level of emissions with wind erosion, regardless of the absence of mechanical disturbance. ENV also indicated that experience at other mine sites has shown tailings beaches can be a source of considerable dust impacts. ENV recommended a dust management plan, including monitoring, be required for the KUG Project to address concerns related to dust emissions.

TKN raised concerns about the impacts of road dust on vegetation and wildlife

consumers along the ORAR and recommended that AuRico be required to monitor the potential impacts of road dust on nearby wildlife and wildlife habitat to adaptively manage road dust based on monitoring results. This issue is discussed in more detail in section 3.5.2.

Considering these concerns related to dust, EAO has proposed an EAC condition for an Air Quality Management Plan, which would include requirements for dust mitigation and monitoring as well as mitigation measures for criteria air contaminants. In addition, the plan would address other requirements relating to human health concerns for off-duty workers at the mine site, including mitigations for PM and monitoring of metal contaminants in fugitive dust, as discussed in the human health assessment in section 5. EAO has also proposed a Wildlife Management and Monitoring Plan, as described in Section 3.5, which would include a requirement for dust monitoring along the ORAR.

3.1.2.1 *Conclusions*

The predictive modelling for air quality for the KUG Project produced contaminant concentrations that were all below the applicable federal and provincial air quality criteria. EAO is satisfied that the air quality modelling and evaluation through the EA was sufficient to inform effects on air quality and identified receptor VCs. The results of this predictive modelling and evaluation were used as inputs when determining the significance to other VCs including Surface Water Quality (section 3.3 of this report), Terrain and Soil (section 3.6 of this report), Terrestrial Ecology (section 3.6 of this report), Wildlife (section 3.5 of this report), and Human Health (section 5 of this report).

3.2 Climate Change

3.2.1 Background

After submission of the Application, both EAO and the Agency requested an additional assessment of the KUG Project related GHG emissions. As a result, AuRico submitted a separate GHG Report as a supplement to the Application. The result of the GHG Report is discussed here.

3.2.1.1 *Description of VC*

The KUG Project has the potential to impact climate change through the emission of GHGs at all project stages. GHG emissions would be caused by land clearing, stationary fuel combustion, fugitive emissions, and on-site transportation for the KUG Project.

The GHG Report measured the following GHGs that contribute to climate change for both the construction and operations phases of the KUG Project where the majority of the emissions generated by the project would occur (emissions from closure and post-closure phases are expected to be limited and intermittent): carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Additional GHG gases: hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride (which are typically released in smaller quantities as a result of industrial processes) were not considered in this assessment as there were no identified sources of these gases for the KUG Project. Total GHG emissions are aggregated into carbon dioxide equivalents (CO_2e), which represents an equivalent amount of CO_2 that would cause the same amount of global warming as the aggregated gases.

The GHG Report compared predicted GHG emissions with provincial, federal and global GHG level totals to determine the level of effect the KUG Project GHG emissions would have on the atmosphere.

3.2.1.2 *Applicable Legislation and Policy*

The Intergovernmental Panel on Climate Change (IPCC) is an international scientific body under the United Nations whose role is to assess available scientific information related to climate change. The IPCC's scientific consensus is that anthropogenic sources of GHG emissions are altering the global climate, and that concentrations above 450 parts per million (ppm) of CO_2 in the atmosphere would result in a 50% chance of increasing average global temperatures by 2^{o} Celsius (C) over the pre-industrial average. The Government of Canada has set a target of reducing Canada's total GHG emissions by 30% from 2005 levels by 2030. At present, with respect to GHG

emissions reporting, ECCC requires that any facility emitting more than 50 kiloton (kt) of CO_2e report its annual GHG emissions online.

In 2007, the BC Government passed the *Greenhouse Gas Reduction Act*, legislating provincial GHG reduction targets of at least 33% below 2007 emission levels by 2020 and at least 80% below by 2050. In order to achieve the legislated GHG reduction goals, BC has designed and implemented a suite of policy, regulatory, and legislative measures to reduce emissions across the province.

BC's Climate Action Plan is a provincial policy with the goal of reducing GHG emissions. The Plan outlines emission reduction targets and strategies, and initiatives to achieve the targets. Specific policy measures have been applied to reduce emissions in each economic sector. Provincial GHG mitigation measures include carbon tax, emissions standards on vehicles, regulation of landfill gas emissions, a low-carbon fuel standard, and encouraging green community development. BC has also provided funding for capital investments, offset programs and new technologies that contribute to innovations and incentives in reducing GHGs in industries including mining and transportation. The BC Carbon Tax is expected to induce AuRico to select the lowest emission and most economic fuel mix for the KUG Project in the future.

EAO recognizes that the impacts of GHG emissions must be addressed globally, and that it is not possible to estimate the impacts of an individual project's emissions on global climate change. However, EAO also recognizes that BC's GHG reduction targets were established in the context of the best science about the necessary reductions to global GHG emissions to address impacts on global climate change, and that it is BC's responsibility to contribute to the global reduction. As such, individual projects are considered in relation to their contribution to provincial and national emissions, as well as with the industry average of GHG emissions.

3.2.1.3 *Study Areas*

As the effects of GHGs from the KUG Project (or any other point source) would be global in nature, the GHG Report does not establish a LSA or RSA for the climate change VC.

3.2.1.4 *AuRico's Assessment*

The GHG Report identified the following source categories to assess the Project GHG emissions:

- Land clearing (construction only) resulting in the release of stored carbon;

- Stationary fuel combustion including backup diesel generators and heaters and fans;
- Fugitive emissions related to refuelling of equipment from three 114,000 litre above ground storage tanks; and
- On-site transportation including underground mining and surface mobile equipment.

In order to provide conservative estimates consistent with the project description found in the Application, AuRico:

- Used an estimation of 246 ha of disturbed land that includes a buffer zone that may not be disturbed during land clearing activities;
- Assumed 24-hours a day and 365 days a year operation for generators during the construction phase;
- Assumed 500 hours per year for the backup generators during operations; and
- Included the use of heaters and fans associated with fresh air declines in the assessment that are not expected to be used until the later period of the construction phase.

The GHG Report predicts that during the construction phase, total GHG emissions are estimated to be 56,530 tonnes CO_2e annually. This would be about 0.09% of the most recent BC estimate (2014) of 64,000,000 tonnes CO_2e; 0.008% to the national (2014) total and 0.00013% to the global (2012) total. During the operations phase, total GHG emissions are estimated to be 37,802 tonnes CO_2e annually. This equates to about 0.06% of the most recent BC estimate, 0.005% of the federal estimate, and about 0.00008% of the total global emissions.

The predicted annual GHGs emissions by project source for both construction and operations phases are summarized in Table 6 below.

Table 6: GHG Emissions from the KUG Project by Source

Source Category	**Total Annual Construction Emissions (tonne)**				**Total Annual Operations Emissions (tonne)**			
	CO_2	**CH_4**	**N_2O**	**CO_2e**	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
Land Clearing	0	0	0	**16,959**	0	0	0	**0**
Stationary Fuel Combustion	30,389	0.62	2.51	**31,151**	26,816	0.44	1.95	**27,407**
Fugitive	0	0.09	0	**2.16**	0	0.09	0	**2.16**

Source Category	Total Annual Construction Emissions (tonne)				Total Annual Operations Emissions (tonne)			
On-site Transportation	9,683	0.49	1.45	**10,129**	9,935	0.5	1.49	**10,392**
Total	**40,072**	**1.20**	**3.96**	**58,241**	**36,751**	**1.03**	**3.44**	**37,802**

3.2.1.5 *Mitigation Measures*

AuRico addressed a number of potential effects to climate change from GHG emissions through project design including:

- The use of an underground mine rather than an aboveground mine, eliminating the need for diesel fuelled haul trucks and using electric drive conveyors instead to transport ore; and
- The use of an electrical grid from BC Hydro to power both the underground and aboveground equipment including the primary crusher and process plant.

The GHG Report lists many mitigation measures to address the effects to climate change from GHG emissions, including:

- Implementation of energy efficiency measures including fuel efficiency;
- Procurement policies to identify fuel and equipment specifications;
- Regular servicing of all mobile and stationary equipment;
- Training and instruction for on-site staff with duties related to the operation of equipment that emits air pollutants or controls air emissions;
- Reducing equipment exhaust by: retrofitting older engines, using low-sulphur diesel, reducing idle times, using electric powered equipment whenever practical, and operating vehicles at designated speeds on site roads;
- Reducing stack emissions by monitoring generator, heater and fan fuel consumption and operating parameters to ensure efficient operation;
- Limiting new land clearing disturbance and recovery of merchantable timber; and
- Partially restoring the natural carbon sink on site by reclaiming much of the disturbed areas.

AuRico has also proposed an Air Quality Management Plan to establish measures (including those listed above) to mitigate emissions including GHG emissions from the KUG Project activities to meet air quality legislative requirements.

3.2.2 Discussion of Issues

EAO received review comments on the GHG Report from FLNRO, ENV and ECCC.

AuRico provided responses to these comments and EAO has considered these responses in EAO's characterization of residual effects (presented below). The issues tracking tables include all comments received on the GHG Report, including those that were for clarification.

EAO received technical comments and advice on the GHG Report from FLNRO and ENV around the characterization of GHG emissions which provided EAO with valuable guidance on determining significance.

3.2.3 Analysis and Conclusions

After considering the mitigation measures listed above, EAO concludes that the KUG Project will have residual adverse effects on climate change from increases to GHG emissions during construction and operations.

Table 7: Summary of Residual Effects for Climate Change from GHG Emissions

Criteria	Assessment Rating	Rationale
Context	Moderate to high sensitivity	The international scientific community is in agreement that past and current GHG emissions are already at levels that are affecting climate change and the global climate.
Magnitude	Negligible - low	GHG emissions from the KUG Project are negligible to low when compared to global, national and provincial levels. The emissions would be 0.00013% during construction, 0.00008% during operations when compared to global totals; 0.008% during construction, 0.005% during operations when compared to national totals; and 0.09% during construction, 0.06% during operations when compared to provincial totals.
Extent	Beyond Regional (global)	Impacts to climate change through GHG emissions are an issue at a global scale.
Duration	Far Future	The predicted impacts to climate change would continue after the KUG Project emissions have stopped.
Reversibility	Irreversible	It is not currently known if climate change is reversible in the long term. Therefore EAO characterizes impacts to climate change as irreversible.

Criteria	Assessment Rating	Rationale
Frequency (of residual effect)	Continuous	Impacts to climate change would be continuous throughout the KUG Project.
Likelihood	High: It is highly likely that there would be residual impacts to climate change from GHG emissions based on the use of fossil fuels and land-use change activities of the KUG Project.	
Significance Determination	Not Significant: Although the predicted effects to climate change would occur continuously, be irreversible and global in extent, EAO is satisfied that the KUG Project would not have significant adverse effects to climate change, primarily due to the negligible to low predicted magnitude of the residual effects in consideration of global, national and provincial levels.	
Confidence	High: EAO has a high level of confidence in the significance and likelihood determinations, as the GHG estimates presented in the GHG Report are based on a cause-effect relationship that is well understood, and the GHG emissions are based on a reasonably conservative estimation. GHG emissions and the technical approach for estimating GHG emissions also follow a standard methodology.	

3.2.4 Cumulative Effects

EAO did not conduct a cumulative effects assessment for climate change as GHG emissions from the KUG Project would act at a global scale.

3.2.5 Conclusions

Considering the above assessment and having regard to BC's Climate Action Plan, which includes the Carbon Tax that will apply at the start of the KUG Project, the conditions identified in the Table of Conditions (TOC) and the CPD including an Air Quality Management Plan (which would become legally binding as a condition of an EAC), EAO is satisfied that the KUG Project is not likely to have significant adverse effects related to climate change.

3.3 Water

3.3.1 Background

The Application assesses impacts to water through four VCs:

- groundwater quantity
- groundwater quality
- surface water hydrology
- surface water quality

The updated feasibility study included additional potential residual effects to surface water quality as indicated by predicted changes in indicators. The assessment below includes the additional effects identified in the supplement.

The KUG Project could impact the water VCs through a variety of activities, such as the development of decline access tunnels; panel cave development and mining; discharging excess water from the KUG Project TSF; excavating and exposing PAG material; and flooding of the cave in closure and post-closure. Surface water quality could be additionally affected by erosion and sedimentation, N loading from explosives and atmospheric dust deposition from various mining activities and equipment use.

The watercourses and water bodies potentially affected by the KUG Project are those in proximity to the proposed mine (see section “Study Areas” below for locations): Attichika, Attycelley, East Cirque, Central Cirque, Kemess, and, Waste Rock creeks; Finlay River; Amazay and Thutade lakes.

The KUG Project is located immediately adjacent to the past producing KS open pit mine that operated from 1998-2011. Where available, AuRico used data from the KS and KN assessments to support the KUG Project Application. As noted below, “current conditions” for the water related VC assessments are post-closure of KS (i.e., it considers effects from KS on water as part of the baseline for the KUG Project water assessments).

The effects from the water VC assessments feed into the evaluation of other VCs, such as fish and aquatic habitat, terrestrial ecology, wildlife and human health.

3.3.1.1 *Description of VCs*

The Application evaluates potential effects to the water VCs through a prediction of changes to the indicators listed in brackets below. A brief summary of the methods used is also provided below each VC.

Groundwater Quantity

(Indicators: Groundwater levels, Flow volume and directions)

AuRico used a network of piezometers and monitoring wells to measure groundwater levels, and measured late-winter streamflow to characterize the seasonal-low groundwater discharge rate. AuRico also developed a three dimensional groundwater flow model to estimate baseline groundwater flow rates and flow directions, and to predict potential impacts on groundwater quantity and flow directions in the underground workings area (LSA1). The objectives of the model were to predict the following:

- Dewatering rates for the mine;
- Magnitude of surface water / groundwater interactions (including changes to base flows and streams);
- Flow paths and groundwater flux for mine contact water;
- The time for re-flooding of the mine;
- Groundwater flow paths and flow to receiving waters during re-flooding of the mine; and
- The sensitivity of the seepage and travel times within a credible range of input parameters.

The seepage rate from the KUG Project TSF was estimated in combination with a two dimensional seepage model developed for the dam.

Hydrogeological data collection in the underground mine area started in 2003 to support the Application for the proposed KN. In 2011, AuRico added to the pre-existing program with drilling, hydraulic testing and the installation of new monitoring wells in support of the KUG Project. Groundwater monitoring conducted in 2012 and 2013 included water quantity and quality data collection from the 2011 monitoring wells and some of the 2003 wells. For the area around the KUG Project TSF, hydrogeological and geotechnical investigations were conducted in 2000 and 2011 in support of KS. Additionally, monitoring wells were installed in and around the KS pit and waste rock dumps in 2002 and 2008.

Groundwater Quality

(Indicators: Total and dissolved metals, Anions/Nutrients, Alkalinity/Acidity, Turbidity, Total suspended solids [TSS], potential of hydrogen [pH], Conductivity, Temperature)

The Application predicts possible effects to groundwater quality in the underground workings and KUG Project TSF areas by using models of groundwater flow and information on the geochemical reactivity of the primary rock units through which the

groundwater flows. The Application uses kinetic tests including laboratory trickle leach columns and larger scale field bins to evaluate the source terms used to estimate geochemical loading of each of the relevant major rock units for the KUG Project[6]. Groundwater quality data were collected from the vicinity of the planned underground mine and KUG Project TSF starting in 2003 and 2002 respectively.

Activities associated with the past operating KS impacted levels of sulphate (SO_4) and N species (nitrate and nitrite) in the overburden groundwater (groundwater in water saturated soils above bedrock groundwater) in the area to the south of the KUG Project TSF open pit. SO_4 concentrations in 2002 (pre-KS) were typically less than 15 milligrams per litre (mg/L) whereas levels between 2012 and 2014 (KS post-closure) were between 300 mg/L and 575 mg/L. For nitrate, levels prior to KS were less than 1 mg/L and were between less than 1 mg/L and 14 mg/L in the post-closure period.

Surface Hydrology

(Indicators: Stream flow volumes, Frequency and duration of discharge events, Shifts in seasonal distribution of stream flow)

The Application uses a water balance model to predict changes to surface hydrology (see Appendix 11-D of the Application for further details on this model). The primary inputs to the model are the mine plan, groundwater information, groundwater modelling results, and hydrology and climate data (see Appendix 10-A of the Application). The hydrometric monitoring stations used for the KUG Project (see Table 10.4-1 of the Application) have varying periods of record starting from 2003 (earliest) to 2009 (latest) to the present. The water balance model incorporates both the existing KS and the KUG Project. It estimates monthly discharges beyond the end of post-closure at 17 water balance model nodes for both a “with” and “without” KUG Project scenario (see Table 10.6-1 of the Application for a list of the 17 water balance model nodes; they are located on all of the watercourses listed in the background section above). In order to account for the impact of drier or wetter years, the Application runs the “with” and “without” KUG Project water balances through 30 realizations, such that every year of the mine life is run with each one of the 30 years of input data. Additionally, in order to account for more extreme variations, 1:100 wet – and dry-years were superimposed within the water balance model on a sensitive year (from a water quality perspective) per phase of the mine life.

Surface Water Quality

(Indicators: Total and dissolved metals, Anions/Nutrients, Alkalinity/Acidity, Turbidity,

[6] In trickle leach column testing water is passed through the various geological units that exist in the environment in a laboratory setting in order to evaluate the effects these materials have on water quality.

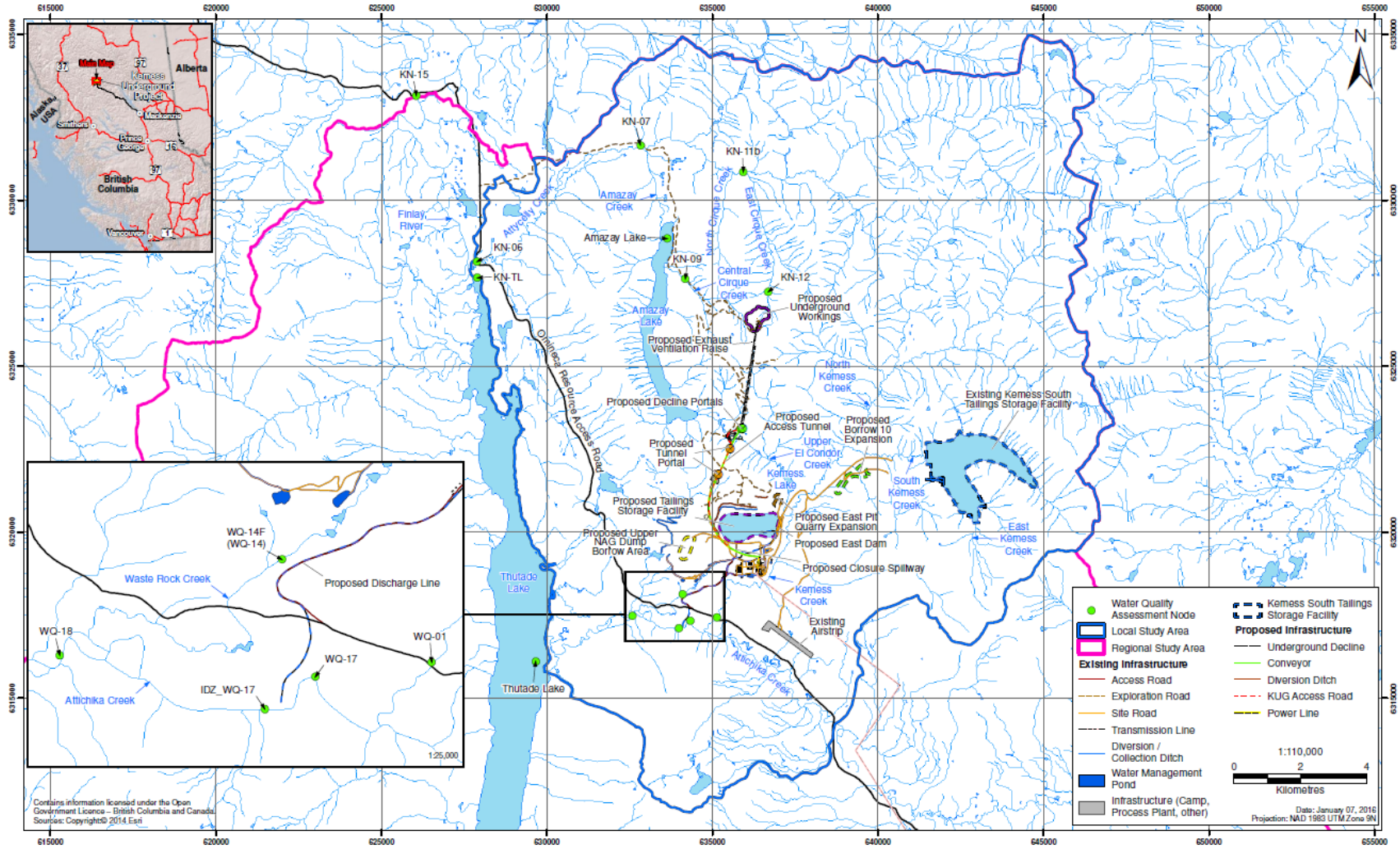
TSS, pH, Conductivity, Temperature)

Surface water quality sampling sites were established in 1996 at the mine site prior to KS construction, and routine stream sampling has been conducted since this time. Water quality data has been collected in the underground mine area since 2002, associated with planning for KN. Water quality monitoring on the Finlay River began in 2003, at the outlet of Thutade Lake in 2012 and on the lake itself in 2014. Current conditions for the KUG Project water quality assessment are representative of post-closure conditions for KS for those water quality monitoring sites within the footprint of the former KS.

The Application assesses potential residual effects to surface water quality from direct discharges, groundwater interactions and seepage, metal leaching (ML)/acid rock drainage (ARD) and N loading from blasting residues with a predictive water quality model that considers inputs from the major mine sources (see Appendix 11-D of the Application for details on the model)[7]. The Application predicts water quality at 14 water quality assessment nodes (see Figure 3 below for their locations). Importantly, to assess potential residual effects from the KUG Project, predictions of water quality are compared against modelled “background” conditions. The latter are predicted water quality conditions without the KUG Project, but with predicted water quality impacts from the ongoing care and maintenance of the KS (e.g. including the potential impacts of the KS TSF over time).

[7] The major mine-related sources the water quality model uses as inputs include: underground mine discharges and seepage, seepage and discharges from the KUG Project TSF, discharge of tailings solids to the KUG Project TSF and processing facility effluent, loadings from the East Dam, loadings from the exposed highwalls of the KUG Project TSF, waste rock, and ore.

Figure 3: Water Quality Assessment Nodes



Mining and exploration activities associated with the past producing KS affected water quality in a variety of watercourses. The list below presents those watercourses that had water quality concentrations above BC Water Quality Guidelines (WQG) at least once during the KS post-closure phase (i.e., in existing conditions):

- Kemess Creek: dissolved aluminum (Al) and total copper (Cu);
- Attichika Creek: dissolved Al, total chromium (Cr), total Cu; and
- Waste Rock Creek: nitrate, nitrite, total Cr, total Cu, total iron (Fe), total mercury (Hg) (although Hg has measured below detection limits since 2011), total Se.

Table 8 shows the changes in Se and nitrate in Waste Rock Creek prior to KS and post KS closure.

Table 8: Se and nitrate levels in Waste Rock Creek before and after KS

	Pre KS		**Post KS (up to the end of 2014)**	
	Minimum	Maximum	Minimum	Maximum
Se	0.00025 mg/L (all year)	0.0006 mg/L (November to January)	0.0193 mg/L (May to July)	0.0960 mg/L (February to April)
Nitrate	0.0025 mg/L (May to January)	0.0190 mg/L (February to April)	4.10 mg/L (May to July)	25.3 mg/L (February to April)

AuRico has communicated that recent results for total Se and nitrate indicate decreasing trends. The reader is directed to memo “20160805_B.1_KUG Comment TKN-055 056_WQ_Memo” for information on the frequency of exceedances of WQG in Kemess, Attichika and Waste Rock creeks for these water quality parameters and to tables 11-4.3, 11.4-4, and 11.4-5 in the Application for specific values in these creeks pre-KS, during operations and post-closure.

The Application focuses on two primary predicted water quality scenarios: a “base case”, which is the “most likely” scenario and relies on median values for input terms; and an “upper case”, which relies on 95th percentile surface water quality inputs[8]. The “upper case” is scenario number five, of six sensitivity scenarios, in the Application; AuRico worked with TKN to identify it as the most appropriate upper case (see section 11.6.1.2 of the Application for further details on the six scenarios).

[8] The Application assesses six sensitivity scenarios in addition to the base case (see section 11.6.1.2 of the Application for further details on these scenarios).

As a result of consultation with TKN and information in the Traditional Land Use Study (TLUS) indicating their cultural importance, there are assessment nodes for the water quality model at Amazay Lake, Thutade Lake and Finlay River (see Figure 11.6-2 of the Application for all assessment nodes). The Application uses a combination of the best available data and professional judgement to predict residual effects due to sedimentation and erosion.

The Application models effects to the following water quality parameters:

- Anions and Nutrients: Chloride (Cl), Ammonia, Nitrite, Nitrate, SO_4;
- Total Metals: Silver (Ag), Al, Arsenic (As), Boron (B), Barium (Ba), Beryllium (Be), Cadmium (Cd), Cobalt (Co), Cr, Cu, Fe, Hg, Lithium (Li), Manganese (Mn), Molybdenum (Mo), Nickel (Ni), Lead (Pb), Antimony (Sb), Se, Strontium (Sr), Titanium (Ti), Thallium (Tl), Uranium (U), Vanadiuim (V), Zinc (Zn); and
- Dissolved Metals: Al, Cd, Fe.

AuRico proposes to treat water prior to discharge to the receiving environment as follows:

- Se treatment: An Se treatment plant with ion exchange technology (Se-IX^{TM}) of 50 litres per second (L/s) capacity located in the processing facility would be commissioned during the construction phase (Year -4). During construction, water from the existing KS waste rock dump SeCP would be treated by the Se treatment plant and then directed to the TSF. During operations and closure, water from the TSF would be directed to the Se treatment plant and treated up to 50 L/s prior to discharge to Attichika Creek.
- Metals treatment: A dissolved MR treatment plant of an expected 120 L/s capacity located in the processing facility would be commissioned in the first year of operations. Water in the TSF would be treated for dissolved metals (in addition to Se treatment) prior to discharge into Attichika Creek during operations and closure (predicted to be a six year period).

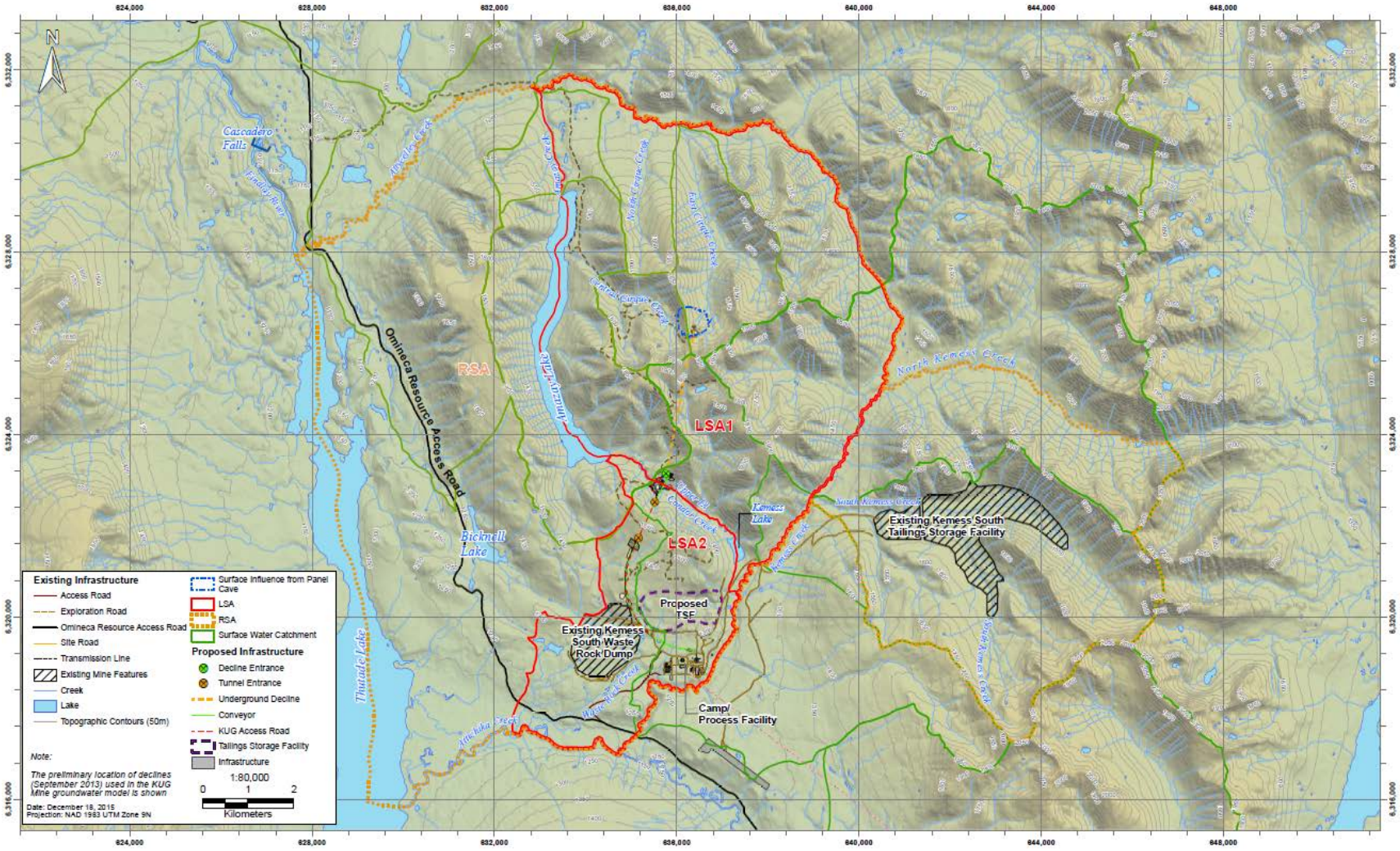
The predicted residual effects to water quality (summarized below) includes the treatment outlined above.

3.3.1.2 *Study Areas*

Groundwater Quantity and Quality

The spatial boundaries for the hydrogeology assessment are presented in Figure 4 below.

Figure 4: Groundwater LSA and RSA



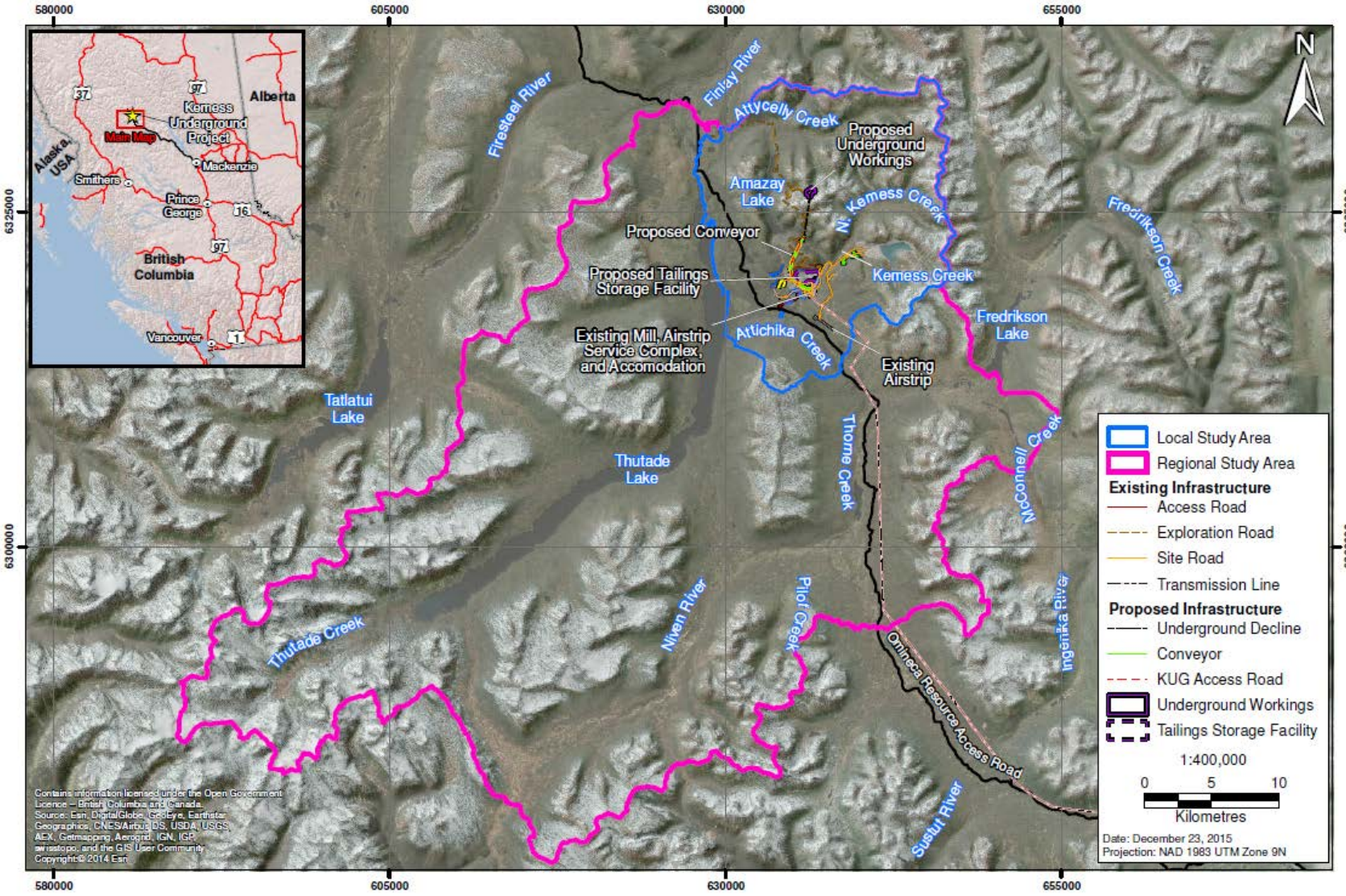
There are two LSAs for groundwater quantity and quality, defined by the hydrogeological boundaries of the hydrogeology system that has the potential to be directly affected by development and operation of the KUG Project. LSA1 is the area around the underground mine in hydraulic connection with the local hydrogeology system. LSA2 includes the area around the proposed TSF and mine camp connected to the local groundwater system south of LSA1.

The RSA contains all existing and proposed new infrastructure and is defined by natural hydrogeological boundaries of the groundwater system and the hydrologic boundaries of the receiving surface waters. It includes the KUG Project footprint and areas located up- and down gradient from the KUG Project and represents the maximum limit where hydrogeological effects might occur.

Surface Hydrology and Water Quality

The LSA and RSA for surface hydrology and surface water quality are the same. Figure 5 below shows the LSA and RSA used for both assessments.

Figure 5: Surface Hydrology and Water Quality LSA and RSA



The LSA includes all site drainages with the potential to be directly affected by development and operation of the KUG Project, the KS and KS TSF. The RSA includes the entirety of Thutade Lake and the Finlay River outflow to the confluence of the Firesteel River. The RSA represents the maximum limit where measurable project effects on surface hydrology and surface water quality could occur.

3.3.1.3 *AuRico's Assessment*

The following sections provide a summary of the Application's predictions on effects to water.

Groundwater Quantity (LSA1) and Surface Hydrology – Underground Mine Area

Given the close relationship between groundwater quantity and surface hydrology in the underground mine area (the groundwater LSA1), AuRico's predictions for both are presented together here.

In the early stages of underground mine development, mine inflow rates (i.e., water flowing from around the mine components inwards to the underground workings) would increase as the mine declines are created, and the cave zone is developed. This would lower the water table and create a "drawdown cone" around the mine cave area, extending beneath the headwaters and surface water catchments of East Cirque Creek and Central Cirque Creek (see Figure 9.6-6 of the Application).The water flowing into the underground mine would need to be pumped out of the mine and into the TSF. The Application predicts a reduction in baseflows in East and Central Cirque Creeks of 33% (18 L/s to 12 L/s) and around 40% (8.7 L/s to 5.4 L/s) respectively from baseline levels at the end of operations. The Application also predicts that the groundwater flow divide between East and Central Cirque catchments will shift westward, but will remain intact (thereby isolating the underground mine hydraulically from Amazay Lake).

Dewatering of the mine would stop at the end of operations and the underground mine would re-flood. AuRico predicts that the underground mine would re-flood to an ultimate elevation of 1590 metres above sea level (masl) around 35 years after the end of operations. AuRico reports that measured baseline groundwater levels in the footprint of the subsidence zone range from 1616 m to 1694 m and could be higher under the axis of the north-south ridge. The predicted re-flooding time considered groundwater contributions from laterally intact bedrock next to the development and enhanced recharge over the subsidence zone. Runoff from nearby slopes, which would expedite re-flooding, was not incorporated into the re-flooding time estimate. The contact water seepage from the underground mine is predicted to flow to East Cirque Creek. AuRico predicts that creation of higher permeability rubblized rock in the cave zone would permanently alter the water table configuration and groundwater flowpaths in

comparison to baseline conditions. During post-closure, the Application predicts a 28% increase in baseflow to East Cirque Creek relative to baseline due to the groundwater divide shift. Baseflow in Central Cirque Creek is expected to decline by 37% relative under post-closure conditions relative to baseline.

Groundwater Quantity (LSA2) - TSF Area

The KUG Project TSF would act as a groundwater sink (i.e., groundwater would flow into the TSF) during construction and operations. In the absence of the KUG Project, the TSF (which is the mined out pit for the KS project) would re-flood naturally to an elevation of approximately 1255 masl, but tailings deposition from the KUG Project would increase the pit elevation in the KUG Project TSF by up to 15 m, to around 1270 masl. Later in operations and onwards, groundwater flows would reverse. At closure, AuRico predicts that seepage would occur through the East Dam east to Kemess Creek and through the south pit wall south to Kemess Creek and Waste Rock Creek. The Application estimates that seepage would be approximately 1 L/s through the south wall of the KUG Project TSF for a length of 1750 m and 0.4 L/s through the East Dam and underlying bedrock for a dam length of 720 m. This would amount to a total estimated seepage rate from the KUG Project TSF of 1.4 L/s. The Application notes that the increase of 1.4 L/s would represent a minor baseflow increase to Kemess Creek and would likely be immeasurable at the closest downstream hydrometric station (WQ-01) on Kemess Creek. The Application reports that the mean annual discharge at WQ-01 for baseline conditions (i.e., without the KUG Project) at the time when closure would occur would be 2.052 cubic metres per second (m^3/s) (2052 L/s; see Table 10C.1.1-1 of Appendix 10-C), which is orders of magnitude larger than the predicted seepage from the KUG Project TSF.

Surface Hydrology – TSF Area

The Application considers any changes from baseline values below 5% to fall within the bounds of measurement error and modeling uncertainty, and therefore predicted variations from the baseline condition that fall below this threshold are considered to be negligible. The Application notes that predicted changes below this threshold were not carried forward to the residual effects assessment.

During the construction phase, the existing water in the KS pit will need to be discharged into Attichika Creek so that it can be used as the KUG Project TSF. The Application predicts flows in Attichika Creek would be increased due to this dewatering. During operations and closure, water from the KUG Project TSF is also discharged into Attichika Creek. With the exception of three cases, the model predicts increases in flows to be less than 5%. The exceptions were a 5 to 5.3% increase from baseline flows in August to October during construction in the 90^{th} percentile of the 30 model realizations,

predictions of a 5-7% increase for the 1:100 dry-year scenario during construction, and a 5-6% increase during operations. Therefore the Application does not consider these flow changes further in the residual effects assessment.

Starting at closure and continuing indefinitely the Application predicts the flow to Waste Rock Creek would increase throughout the year because the SeCP and the KUG Project TSF would overflow to the creek (the latter via the closure spillway). The estimate of flow increases range from 5.4% (10^{th} percentile) to 183.1% (90^{th} percentile) of flows from baseline in the closure phase, with mean increases ranging from 10% to 163.1%. Predicted increases in the post-closure phase range from 21.2% (10^{th} percentile) to 313.3% (90^{th} percentile), with mean increases ranging from 36.7% to 290.7%.

To place these results in context of pre-KS conditions, AuRico noted that the pre-KS Waste Rock Creek drainage was approximately 9 square kilometres (km^2), and as a result of the operation and closure of KS, the contributing drainage area was reduced by half. Therefore, the projected increase in streamflows in this drainage are likely to bring the current regime closer to the pre-KS condition (see memo "20160805_A.1_KUG Comments TKN-048, 049, 050, 118_,WQ_Memo" for further details).

Groundwater Quality (LSA1) – Underground Mine Area

The Application predicts that during operations, dewatering of the underground area would result in a lowering of the groundwater table, ultimately to the level of the underground workings. In addition, the panel caving operations would result in significant fracturing of the overlying rock within the subsidence zone. AuRico notes that the intense fracturing of the bedrock and the significant change in the water table elevation within the subsidence zone has the potential to alter the chemical reactivity conditions within the bedrock and the fractured zone and the potential for increased exposure to oxygen.

While the Application indicated that the rate of downward oxygen diffusion into the bedrock is likely to be very slow, the Application conducted testwork on the key rock units which conservatively assumed fully oxic conditions from surface to 600 m depth.

The Application notes that groundwater quality during operations would be a function of the geochemical reactivity of the three primary rock units within the cave zone (Gossan, Takla and Black Lake Intrusive [BLI]) as water, including precipitation, would flow through these units. During post-closure, after re-flooding, the water table is predicted to re-establish in the Gossan unit and therefore shallow groundwater would be influenced only by flow through the Gossan, which is the upper unit.

Results from the laboratory trickle leach column tests predict that although Gossan

leachate would be acidic, geochemical loadings from this layer would be sufficiently neutralized as the water flowed down through the underlying Takla unit and would prevent the onset of acidic conditions in lower units. The water flowing further down through the BLI ore material would then provide further acidic buffering. Similarly, elevated Cu concentrations in water passing through the Gossan are predicted to decrease after passing through the Takla and BLI layers, with final concentrations of approximately 0.035 to 0.05 mg/L.

The Application predicts that acidic conditions would not likely develop in the fractured Takla unit of the subsidence zone between operations and closure, prior to re-flooding of the Takla; therefore the water captured in the Takla unit would remain circumneutral.

Within the cave zone (i.e. deep groundwater in the Takla unit), the Application predicts that concentrations of the following parameters would increase above baseline due to the KUG Project: SO_4, As, Cd, Cu, Mn, Ni, Se and Zn (see Table 9 below; and Figure 9.6-19 of the Application). The Application predicts that the quality of shallow groundwater in the Gossan would not change from current conditions.

Table 9: Existing Baseline and Predicted Post-closure Groundwater quality in Takla Unit (deep groundwater) in LSA1 (Underground Mine Area)

Parameter	Baseline	Post-closure	Factor Increase over Baseline
SO_4	76-117 micrograms per litre (mg/L)	1900-2100 mg/L	18
Al	0.072-0.38 mg/L	0.013-0.02 mg/L	-19
As	0.46-0.75 µg/L	0.9-3.4 µg/L	4.5
Cd	0.014-0.067 µg/L	3.2-3.5 µg/L	52
Cu	0.6-2.3 µg/L	54-130 µg/L	56.5
Fe	120-670 µg/L	10-100 µg/L	-6.7
Mn	63-110 µg/L	1200 µg/L	11
Ni	0.5-1.3 µg/L	8-25 µg/L	19
Pb	0.11-0.29 µg/L	0.5-1.6 µg/L	5.5
Se	0.38-0.61 µg/L	20-36 µg/L	59
Zn	3.0-5.9 µg/L	13-20 µg/L	3.4

The Application states that these effects to groundwater quality would persist past post-closure due to the low hydraulic conductivity of the bedrock around the subsidence zone which limits groundwater transport. Over thousands of years the impacted groundwater in the subsidence zone would be replaced by un-impacted water from the surrounding bedrock, which would eventually reduce the effects on groundwater quality from the KUG Project in the underground mine area.

Contact water from the cave zone that migrates along groundwater pathways is predicted to discharge solely to East Cirque Creek because the following groundwater divides have been interpreted from models for baseline conditions and have also been interpreted to persist post-closure:

- Between East Cirque Creek and Amazay Lake; and
- Between LSA1 and LSA2.

AuRico notes that the successful completion of a decline plug is a critical component of constraining discharge of contact water via groundwater pathways to East Cirque Creek.

Groundwater Quality (LSA2) – KUG Project TSF Area

The Application assumed that seepage water quality from the KUG Project TSF to groundwater and eventually Kemess Creek would be the same as that within the KUG Project TSF. Groundwater quality of the bedrock would be affected by seepage from the KUG Project TSF during late operations and into post-closure (although to a lesser degree in this latter stage). The Application predicts that levels of the following parameters would increase relative to baseline bedrock water quality levels: ammonia, nitrite, nitrate, SO_4, Al, As, Cd, Cu, Fe, Mn, Ni, Pb, Se and Zn. The factor of increase over baseline levels for these parameters in the late operations stage would range from seven for SO_4 to 804 for Ni (see Table 9.6-15 of the Application). The Application predicts that water quality in the KUG Project TSF would improve at the end of operations and into post-closure. Groundwater quality impacts would be limited to the bedrock in LSA2.

Surface Water Quality

The Application predicts effects on water quality through screening of water quality parameters against existing modelled background COPC concentrations (see background section above) and WQG. The first step of screening removes parameters whose predicted future levels with the KUG Project would be less than 10% more than modelled background conditions. The second step screens out parameters whose predicted future levels would be less than available guidelines for the most sensitive designated water use (i.e. the Application used the most conservative WQG if several were available). The screening process identifies KUG Project specific COPCs. The summary below reports on the Application's COPC predictions at the various water quality assessment locations (see Figure 3 above for the assessment locations). The water quality predictions assume that water is treated, as noted in the background section above.

The updated feasibility study describes that the increase in tailings and waste rock tonnage that would be stored in the KUG Project TSF would create a larger exposed ("sub-aerial") tailings beach through operations and closure. The effects evaluation looked at potential additional geochemical loadings from the sub-aerial tailings beach to the water in the KUG Project TSF (the Application assumed all tailings were sub-aqueous). The supplement predicted additional COPCs in Attichika Creek (i.e., in addition to those predicted in the Application), which are reported below.

KUG Project TSF Discharge

The KUG Project TSF is not a water quality assessment node that was modelled in the Application. There would be direct discharge from the KUG Project TSF to Attichika Creek during construction, operations and the closure phases. Concentrations of most water quality parameters for water in the KUG Project TSF would increase during construction due to loadings from sources such as the exposed highwalls, dewatering from the underground (which is pumped to the KUG Project TSF) and waste rock deposition. As described above, during construction, water from the KS waste rock SeCP would be treated for Se prior to being pumped into the KUG Project TSF. During operations, water quality parameter concentrations would continue to increase due to loadings of tailings deposition and dewatering from the underground workings. Water from the KUG Project TSF would be treated by both metal reduction and Se treatment during this stage prior to discharge to Attichika Creek.

The Application predicts that during construction, operations and closure, water discharged from the KUG Project TSF would not exceed end-of-pipe discharge criteria. AuRico noted that it is committed to ensuring that effluent is not acutely lethal at end of pipe and that chronic toxicity does not occur at a point of full mixing, consistent with policy and practices for permitting of effluent discharges under the EMA. During post-closure, there would no longer be active water treatment for metals and Se, and there would no longer be any direct discharge from the KUG Project TSF to Attichika Creek, there would only be overflow from the spillway to Waste Rock Creek from the KUG Project TSF. After closure, the Application predicts that water quality in the KUG Project TSF would meet relevant discharge criteria (e.g., federal Metal Mining Effluent Regulations and BC Pollution Control Objectives). The Application states that specific discharge targets for water quality parameters would be developed during the EMA permitting process.

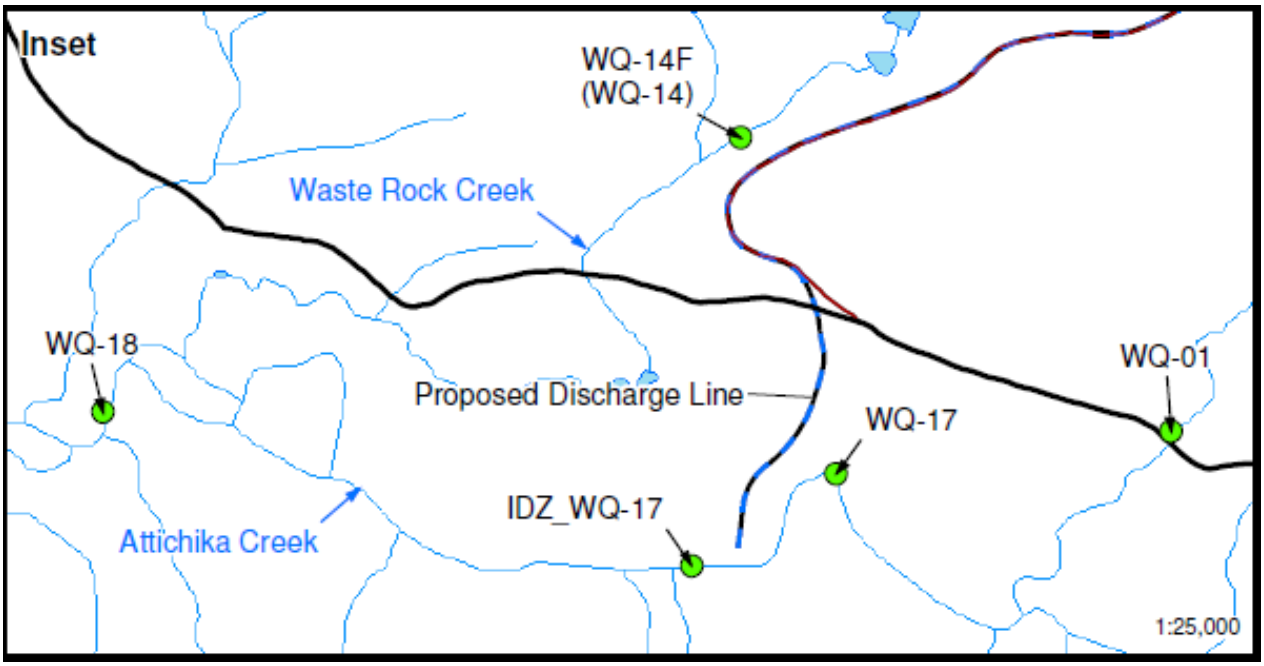
Attichika Creek

As noted above, Attichika Creek would receive direct discharge from the KUG Project TSF during construction, operations and closure. For the base case scenario, the Application does not predict any COPCs (i.e., no water quality parameters would

increase by more than 10% beyond modelled background levels and also exceed the WQG). However, for the upper case, the Application predicts exceedances beyond the range of current variation for total Cd during the construction phase at two assessment nodes (IDZ_WQ-17 and WQ-18) but no COPCs at assessment node WQ-17 (see Figure 6 below for the assessment nodes, and Table 1 and Figure 8 and Figure 9; see Table 11.6-9 of the Application for results of the other sensitivity scenarios). The Attichika IDZ_WQ-17 node is downstream of the proposed discharge location to Attichika Creek, at a point of full mixing. The realized length of the IDZ is not yet established. The updated feasibility study identified additional COPCs for Attichika Creek at the IDZ_WQ-17 and WQ-18 assessment nodes during construction and operations as follows (please see appendix G of this effects evaluation for predicted COPC levels):

- Total and dissolved Al (base and upper cases) and total Cd (base case[9]) – within the range of current variation in base case but above the 95th percentile of current variation for upper case; and
- Dissolved Cd and total Cu (upper case) – predicted levels are above the 95th percentile of current variation for upper case.

Figure 6: Location of Water Quality Prediction Nodes on Attichika Creek



[9] The Application identifies total Cd as a COPC for the upper case only.

Kemess Creek

Kemess Creek would receive seepage from the KUG Project TSF from operations onward. The screening of base case and upper case water quality predictions for Kemess Creek did not identify any COPCs during any project phase. The Application predicts that there would be no residual effects to water quality for Kemess Creek.

Waste Rock Creek

Seepage from the KUG Project TSF would report to Waste Rock Creek from operations onwards. At closure, water from the SeCP from KS would be allowed to overflow into Waste Rock Creek. During post-closure, the KUG Project TSF would overflow through a spillway to Waste Rock Creek.

The Application identifies nitrate and Se concentrations as COPCs in the closure and post-closure phases for both base and upper case scenarios, but predicts that these levels would be within the range of current system variation (except for predicted Se concentrations in August, which would be outside of the current range of variation for August, but within the range of overall variation across all months). The Application identifies Al, Cu and Mo as COPCs for the post-closure period at levels beyond the range of current variation for both the base and upper cases (see Table 10 below). The Application also identifies total Al as a COPC during the closure period for the base case at levels beyond the range of current variation. The identification of nitrate, total Al and Se as COPCs is directly related to allowing the SeCP to overflow to Waste Rock Creek in the closure period. The model assumes that levels of these parameters are the same as currently existing concentrations (i.e. that the cap on the leach cap of the KS waste rock dump is 100% ineffective at lowering parameter levels in the SeCP over time). The incidence and frequency of these COPCs improves in post-closure relative to the modelled closure period as the water in the KUG Project TSF, which would be allowed to overflow to Waste Rock Creek, is of better quality than that of Waste Rock Creek and the SeCP.

East and Central Cirque Creeks

The Application states that concentrations of several water quality parameters are already above WQG in East and Central Cirque creeks due to natural mineralization in the underground mine area. Possible water quality impacts to these watercourses would be limited to the post-closure phase when the underground mine has sufficiently flooded such that hydraulic gradients reverse and contact water from the subsidence zone reports to East Cirque Creek. Prior to this, hydraulic gradients are towards the mine. Hydrogeological modelling indicates that there would be no groundwater pathway from the subsidence zone to Central Cirque Creek.

For East Cirque Creek, the Application predicts concentrations of total Cr in the base case post-closure phase and total Co, Cr, Cu, Fe, and Zn in the upper case post-closure phase as COPCs. However, these parameters would not be beyond the range of current variation.

For Central Cirque Creek, the Application does not predict any COPCs for any mine stage in the base case. In the upper case total and dissolved Al and total Fe are identified as COPCs during the post-closure phase, with dissolved Al and total Fe predicted to be beyond the range of current variation.

Amazay Lake, Thutade Lake, Attycelley Creek and Finlay River

Central Cirque Creek flows into Amazay Lake, which is upstream of Attycelley Creek. Both Thutade Lake and Attycelley Creek flow into the Finlay River (See Figure 3 and Figure 4 above). The Application does not predict any COPCs for any of these watercourses for the base or upper cases.

Table 10 summarizes the Application's predictions of COPCs where water quality parameters exceed the range of the current system variability in different mine stages.

Table 10: Base and Upper Case Water Quality predictions where COPCs identified and exceed the range of current variation[10]

Waterbody (Assessment Node)	BC WQG (mg/L)	Occurrence of COPC			Predicted Concentration Range (mg/L)		Current System Variation (mg/L)	
		Phase	Month	Freq.	Min	Max	5th Percentile	95th Percentile
Waste Rock Creek (WQ-14F)	Total Al (AL 30: 0.10)	Cl	Apr.	100%	0.261	0.275	0.0276	0.119
		PC	Apr.	100%	0.254	0.263	0.0276	0.119
		PC	June	45%	0.101	0.103	0.0170	0.0734
		PC	Sept.	65%	0.102	0.124	0.0141	0.0769
		PC	Sept.	73%	0.121	0.165	0.01405	0.07688
	Total Cu Hardness dependent (see figure 7 below)	PC	May	45%	0.00468	0.00492	0.00191	0.00423
		PC	May	85%	0.00467	0.00548	0.00191	0.0042
	Total Mo (Wildlife*: 0.05)	PC	May	90%	0.0540	0.0716	0.00436	0.0143
		PC	May	85%	0.0543	0.0718	0.00436	0.0143
	Total Se AL 30: 0.002	PC	Aug.	18%	0.0354	0.0599	0.0242	0.0585
		PC	Aug.	18%	0.0355	0.0599	0.02422	0.0585
Attichika Creek (IDZ_WQ_17)	Total Cd Hardness dependent (see figures 8	C	June	40%	0.0000631	0.0000631	0.00000845	0.0000188
			Oct.	40%	0.000107	0.000113	0.0000025	0.000007
Attichika		C	June	40%	0.00005	0.00006	0.0000084	0.000018

[10] Table does not include predictions from the October 2016 effects evaluation on the Updated Feasibility Study.

Waterbody (Assessment Node)	BC WQG (mg/L)	Occurrence of COPC			Predicted Concentration Range (mg/L)		Current System Variation (mg/L)	
Creek (WQ-18)	& 9 below)				0	16	5	8
			Oct.	40%	0.000106	0.000111	0.0000025	0.000005
Central Cirque Creek (KN-09)	Total Fe Al 30: 0.3	PC	Feb	8%	0.441	0.441	0.155	0.436
	Dissolved Al AL 30: 0.05	PC	May	5%	1.17	1.18	0.0380	1.12

Shaded text is base case, unshaded is upper case; Table produced from data in Tables 11.6.5 to 11.6.8 in the Application
AL-30: 30-day (chronic) guideline for the Protection of Aquatic Life; Wildlife: BC WQG for Wildlife
Freq.: Frequency (this refers to the percentage of time the parameter is screened in as a COPC for a particular month and project phase); Min: Minimum; Max: Maximum; Crk: Creek; Cl: Closure; C: Construction; PC: Post-Closure; $^{+}$ Hardness dependent

Figure 7*:* Total Cu concentrations - Waste Rock Creek – WQ-14F (Base Case)

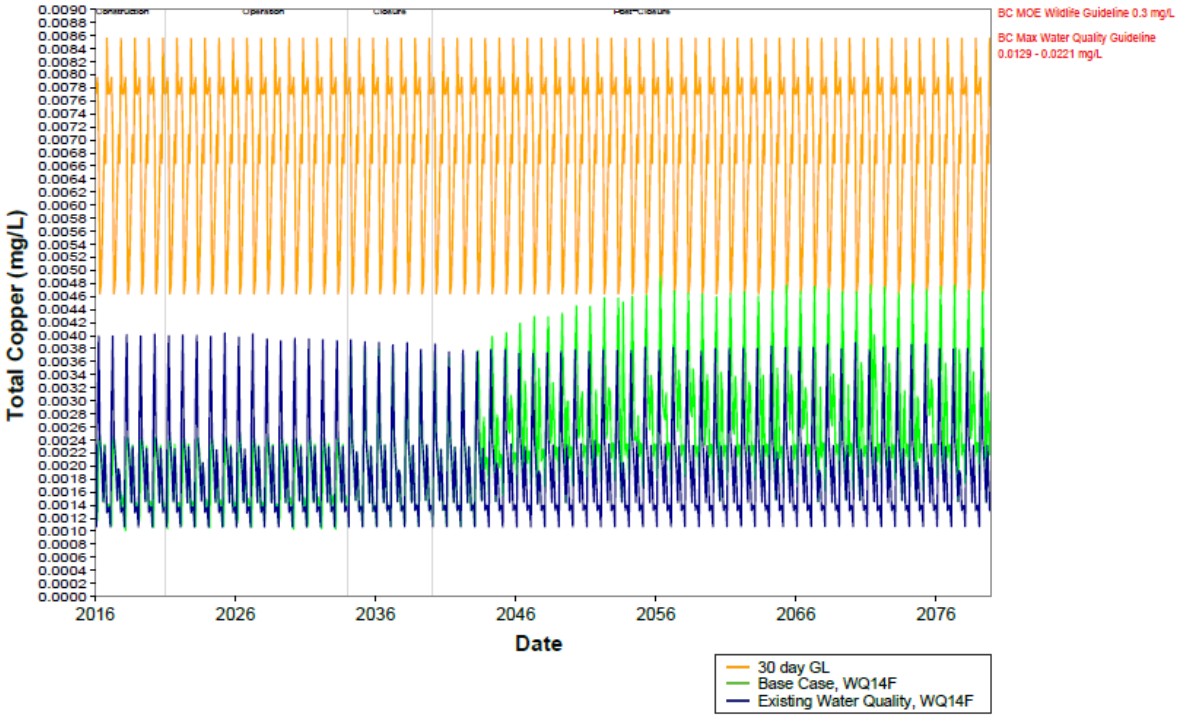


Figure 8: Total Cd – Attichika Creek – IDZ-WQ 17 (Upper Case)

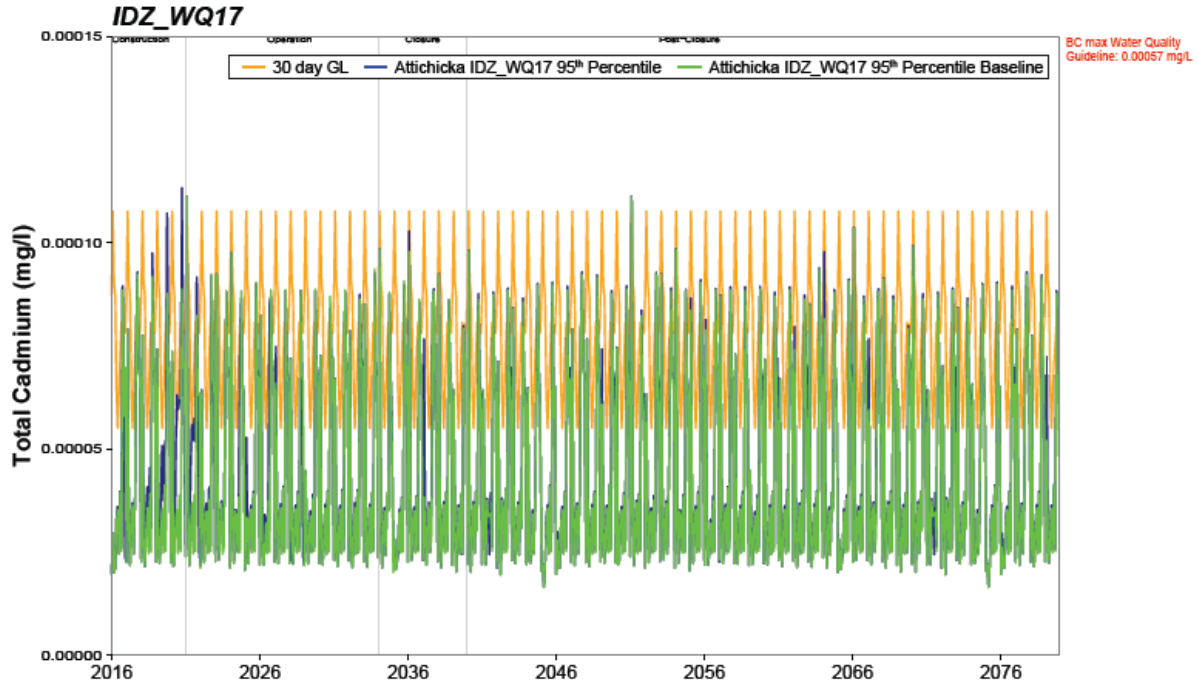
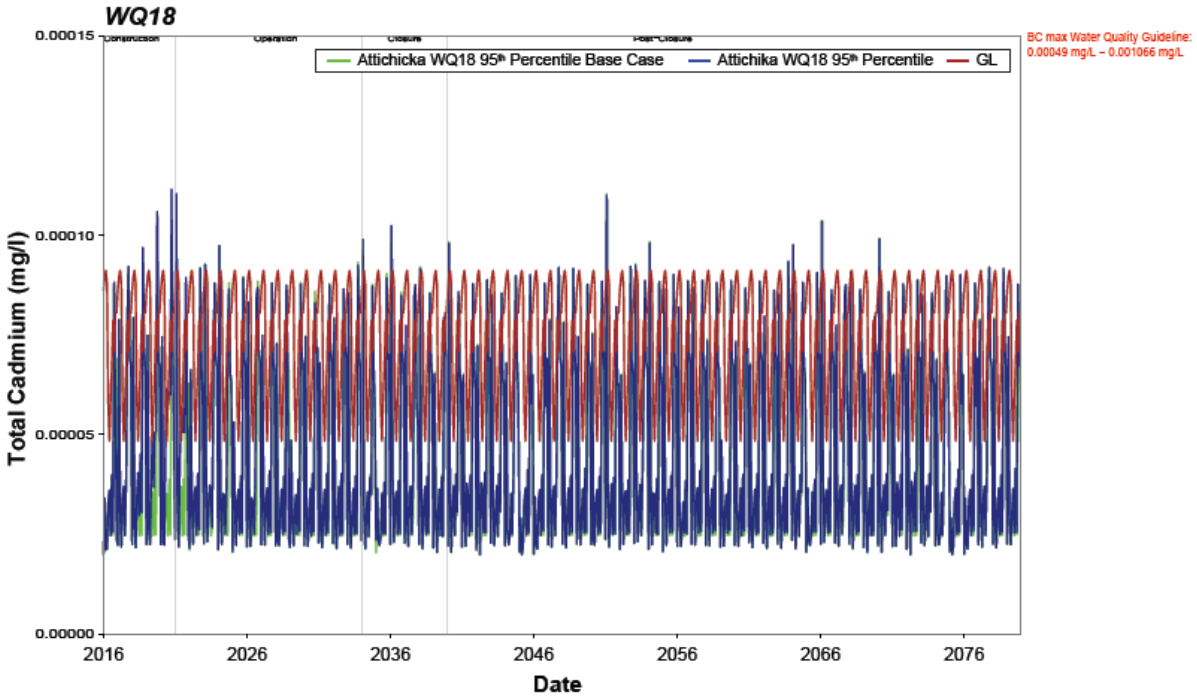


Figure 9: Total Cd – Attichika Creek –WQ 18 (Upper Case)



Sedimentation and Erosion

The Application notes that there is likely a low risk of residual effects from sedimentation and erosion on water quality because there would be limited new surface disturbance for the KUG Project. Additionally, the Application states that mitigation measures and best management strategies that AuRico would employ are effective in minimizing erosion and sedimentation (see Mitigation Measures section below). However, to be conservative, the Application predicts that potential effects from sedimentation and erosion are most likely to occur during construction and closure phases when surface materials would be disturbed due to construction or reclamation activities. Additionally, the Application states that effects are most likely to occur during freshet or rainfall events. The Application states that TSS levels in streams in the LSA are generally low (see Application section 11.4.3) and residual effects could increase TSS and turbidity in these watercourses beyond the range of current variation and above WQG (which are based on background levels for TSS and turbidity). AuRico based these predictions on a combination of best available information, professional judgement and experience.

Mitigation Measures

The Application proposes the mitigation measures below to reduce impacts to water. They are listed by VC for organizational purposes, but many of these mitigation measures would reduce effects to more than one VC.

Groundwater Quantity and Quality

- The long-term mitigation measures would be the installation of hydraulic plugs in the declines at closure to enable flooding of the underground. The Application proposes to install plugs such that seepage from the flooded underground works would drain towards East Cirque Creek. The plugs would prevent discharge of mine influenced groundwater out of the decline and allow the majority of the mine to re-flood thereby limiting opportunities for long-term sulphide oxidation and acid generation within the subsidence zone (beyond that which is already occurring in the Gossan).

Surface Water Hydrology

- Use of the pre-existing KS open pit as the KUG Project TSF, which avoids the need to make a new TSF (which often requires major alterations to drainage).
- Staging discharge of the KS pit water during construction to Attichika Creek on a monthly basis to a volume proportional to the Attichika Creek monthly streamflow and restricting discharge to the open water months is proposed as an EAC condition; and
- Underground panel caving method limits impacts to surface hydrology regime by reducing surface disturbances.

Surface Water Quality

- Water treatment: Se treatment up to 50 L/s starting in construction and continuing to the end of closure (predicted to be a six year period). Dissolved MR treating water at 120 L/s starting in operations and continuing through to the end of closure;
- Use of a diffuser to reduce the length of the mixing zone (i.e., IDZ) for discharge into Attichika Creek;
- Water quality modelling during the closure phase to verify water quality predictions and the timing of the start of the post-closure phase (when treatment would be discontinued);
- Regular testing and managing of direct discharge from the KUG Project TSF to ensure compliance with all applicable discharge requirements;
- Best management practices to reduce erosion and sedimentation such as the following:
    - Minimizing clearing and grubbing dimensions during construction activities;

    - Controlling and directing runoff from disturbed areas by grading slopes and ditching; and
    - Re-vegetating disturbed areas;
- Sediment control strategies would be implemented where soil erosion occurs, such as installing the following: silt fences, sedimentation ponds, and rip-rap along channels and ditches; and
- Mitigation measures to control fugitive dust, such as the following:
    - Wetting roads to minimize dust;
    - Ensuring unpaved roads are compacted and kept in good repair; and
    - Minimizing discharge heights from conveyors onto stockpiles.

Implementation of the following management plans relevant to water (see section 9, Summary of EMPs, of this report for additional details):

- Mine Waste, Tailings and ML/ARD Management Plan –The primary mitigation measures in this plan are the following:
    - PAG waste rock from the underground works would be managed by subaqueous or subterranean deposition in the KUG Project TSF;
    - ML/ARD caused from the exposed underground walls would be mitigated by flooding of the underground mine in closure and post-closure;
    - PAG waste rock from the creation of the access tunnel would be disposed of sub-aqueously in the KUG Project TSF;
    - Avoiding the use of PAG rock for use in construction;
- Water Treatment Plan;
- Surface Water Management Plan;
- Groundwater monitoring plan – mitigation and management strategies for groundwater seepage;
- Surface erosion protection and sediment control plan; and
- Soil handling management plan.

3.3.1.4 *Other Relevant Projects*

The Application notes that for groundwater quantity and quality, surface hydrology and surface water hydrology, the former KS is the only past, present or reasonably foreseeable project that could interact cumulatively with any predicted residual effects from the KUG Project. However for the assessment for all of these VCs, the Application states that the impacts from KS are included as part of current conditions for the KUG Project assessments, and therefore the predictions for the KUG Project are cumulative in nature.

3.3.2 Discussion of Issues

EAO received review comments on the water sections of the Application from the MEM, ENV, ECCC and TKN. EAO also facilitated technical discussions on water with MEM, ENV, ECCC and TKN and has had one to one dialogue with Working Group members to understand key issues in the assessment. Below, EAO has summarized the key EA issues that required resolution as part of the Application review phase. The issues tracking tables include all comments received for water related comments, including those that were for clarification and those that relate to subsequent permitting.

Based on a review of the Application and with feedback from the Working Group, the following key issues related to AuRico's assessment of water were identified:

- Groundwater divide;
- Decline plugs;
- Water balance – mine dewatering;
- Geochemical source terms;
- Water quality; and
- Water treatment.

Groundwater Divide

The Application indicates that there is a groundwater divide between East and Central Cirque creeks. AuRico predicts that due to the project design (including post-closure decline plugs) there would be no water quality impacts from the underground mine to Amazay Lake as there would be no pathway for a potential effect. MEM posed questions about the level of confidence of the existence of this divide due to the current level of groundwater monitoring. In order to assess the potential effects (or lack of effects) of post-closure groundwater seepage from the subsidence zone to Amazay Lake, MEM recommended that AuRico evaluate the potential for water quality effects on Amazay Lake due to seepage from the subsidence zone in the context of historical loadings from Central Cirque Creek. MEM recommended that the analysis include the following components:

1. Calculation of historical loadings from Central Cirque Creek to Amazay Lake for all parameters of concern (POC);
2. Assessment of the corresponding effect of loading from Central Cirque Creek on current water quality in Amazay Lake;
3. An estimate of upper bound groundwater seepage rate from the subsidence zone to Amazay Lake, assuming that a groundwater divide does not separate the subsidence zone from Central Cirque Creek after closure;
4. Estimate of the corresponding groundwater loading; and

5. Assessment of the potential effect of this post-closure groundwater loading in the context of the historical effect of Central Cirque Creek on Amazay Lake.

AuRico reported the following with respect to loadings to Amazay Lake (see "20161021_KUG Comment MEM-160_memo_final" for details):

- SO_4, Ag, calcium (Ca), magnesium (Mg), sodium (Na), Pb, Se, titanium (Ti) – loading to Amazay Lake from Central Cirque Creek plus background sources is in balance with loadings existing in the lake. For SO_4 the dominant loading source is Central Cirque Creek (whereas for the other parameters, the dominant loading source is either background water quality (i.e. low concentrations of parameters) or no dominant source).
- Al, Cd, Co, Cu, Total Fe, Mn, Ni, Zn, As, Pb – loading to Amazay Lake from Central Cirque Creek plus background sources far exceeds loadings from the lake. The dominant source of loading is from the Central Cirque Creek watershed, except for As and Pb where the dominant source of loading is background water.
- U – loading to Amazay lake from Central Cirque Creek plus background sources exceeds total loading to the lake.

AuRico conducted a hypothetical future groundwater loading scenario from the KUG Project subsidence zone that equates to a doubling of the current Central Cirque Creek load to Amazay Lake. The POC identified for Amazay Lake that were used for this assessment were dissolved Al and Cd, and total Cu and Zn. For these POCs, the 90th percentile water quality concentrations for Central Cirque Creek were used as conservative estimates in the loading predictions. The main finding of this assessment was that for dissolved Cd, and total Cu and Zn, the flow needed to double the existing loading rate to Amazay Lake from groundwater seepage would be around 20 L/s. This calculation also assumed that the COPC levels in this flow would have to be over two times the upper bound of what is currently observed in Central Cirque Creek. Current baseflow estimates for the Central Cirque Creek basin are around 5 L/s. Lastly, the doubling of loading to Amazay Lake resulted in only small changes to the water quality in Amazay Lake.

In addition to this assessment, AuRico conducted a sensitivity case that assumed a groundwater divide did not occur and flows were forced to Amazay Lake. The predicted flow levels in this scenario were predicted to be around 0.6 L/s. The analysis then determined the groundwater concentrations of parameters needed to produce loadings equivalent to current loadings to Amazay Lake from Central Cirque Creek. For most of the POCs the groundwater concentration would need to be around 60 times greater than the maximum monthly 90th percentile values currently observed in Central Cirque Creek. AuRico concluded that the conditions required to cause material water quality

changes to Amazay Lake from groundwater seepage from the KUG Project subsidence zone would be very unlikely.

Upon review of this analysis, MEM posed questions related to how conservative the evaluation was. For example, MEM questioned whether the flow in Central Cirque Creek, for the purpose of the background flow estimate, was based on the monitoring site, or was scaled up to the full catchment of Central Cirque Creek, which is about 20% larger. Additionally, MEM questioned the assumptions that other creeks discharging to Amazay Lake contribute only background loadings (i.e. low concentrations of parameters). However, overall they noted that these details could be clarified and the model further refined during the MA permitting stage in support of a groundwater monitoring program.

Natural Resources Canada (NRCan) noted that conservative analyses were conducted and it was satisfied with the conclusion that the changes to Amazay Lake would be negligible.

Given the importance of Amazay Lake to TKN and AuRico's commitment that the KUG Project would not affect Amazay Lake, EAO is proposing an EAC condition requiring AuRico to create an Amazay Lake monitoring plan including surface and groundwater monitoring, in consultation with FLNRO, MEM, ENV, and TKN. While in subsequent permitting processes, the monitoring requirements would be considered, there is no guarantee that the required monitoring would occur at Amazay Lake or focus on effects to Amazay Lake. The protection of Amazay Lake is a key feature to the re-design from KN to the KUG Project, in recognition of the cultural importance of the lake to TKN. This proposed condition would also address TKN's concerns that TKN community members may perceive impacts, even if they are not predicted by modelling.

EAO is also proposing an EAC condition requiring AuRico to establish an Environmental Monitoring Committee and invite participation from TKN and government agencies to facilitate information sharing and provide advice to AuRico on ongoing development of the KUG Project and mitigation measures. This Environmental Monitoring Committee would discuss various topics, one of which would be water quality monitoring.

In consideration of AuRico's analysis that shows it would be extremely unlikely for any material parameter increases to Amazay Lake from the underground mine, and taking into account the condition requiring a monitoring plan that would detect potential effects to Amazay Lake, EAO is satisfied that this issue has been adequately addressed.

EAO also recommends a follow-up program for a surface water quality monitoring plan for Amazay Lake and a groundwater monitoring plan to detect potential groundwater movement from the underground workings towards Amazay Lake. This program could include pre-mining monitoring to characterize pre-mining groundwater levels. The

program would allow predictions in the EA to be checked and ensure no adverse effects to the culturally important Amazay Lake or effects on Aboriginal Interests occur.

Decline Plugs

The Application proposes to install decline plugs in the post-closure period to enable the re-flooding of the underground mine cave area. The Application does not incorporate potential seepage from the plugs into the water quality model, nor does it evaluate the potential for the plugs to fail. Water that may flow from the declines would join the local surface flow regime, eastwards to Upper El Condor Creek and Kemess Lake. MEM and TKN raised the concern that this might underestimate potential COPC levels in the water quality predictions.

To address this concern, AuRico predicted potential seepage rates through the bedrock surrounding the plugs, and assessed these to be less than 1.5 L/s. Partial or progressive failure of one or more of the plugs would result in an increased flow up to 20 L/s in the event of a complete failure of one or more of the plugs. Water that may flow from the declines is anticipated to contain some parameters elevated above local background concentrations, and could represent a risk to the environment requiring mitigation.

AuRico identified the following conceptual contingency measures for plug leakage/ failure:

- Bulk rockfill placed to the back and sides in the declines above the bulkheads;
- Reclamation of the portal area at the entrance to the declines to provide a vegetated and contoured surface;
- New surface ditching to direct outflow from the declines to a desired and environmentally safe discharge location such as Upper El Condor Creek or a outcrop/boulder field that would reduce risk of erosion;
- Retention of the runoff sedimentation pond at the portal area with new ditching to direct decline outflows to the pond;
- Passive water treatment constructed at the portal area; and
- Retention of the mine water transfer pond at the portal area with new ditching to direct decline outflows to the pond.

AuRico stated that as contingency measures are not required until mine closure, they should be reviewed as the mine progresses, noting that any necessary plans and measures would be integrated into a final Reclamation and Closure Plan as part of the MA permitting requirements.

MEM reviewed AuRico’s responses and noted that monitoring of the flow from access

tunnels in addition to an updated Failure Modes and Effects Analysis that includes the decline plug would be required for MA permitting.

NRCan commented that it was satisfied with the proposed contingency measures at the end of operations.

EAO concludes this issue will be appropriately addressed by the MA permitting process. As part of this permitting process, AuRico would be required to submit detailed drawings for the plugs and include detailed information on the potential consequences of failure as part of the reporting requirements. Part of the bonding requirement would be related to the regular inspection and maintenance of the plugs. The time of delivery of the detailed drawings would not occur during the initial permitting stage, as MEM has advised EAO that the appropriate time for delivery of this information is after completion of tunnelling has occurred, to facilitate ground condition evaluations to complete the plug design.

Water Balance – KUG Project TSF volumes

During operations, the underground mine would require ongoing dewatering of groundwater from the underground area. This water would be pumped out and used for ore-processing and sent to the KUG Project TSF for storage, treatment and release. TKN expressed concerns about the potential underestimation of the mine dewatering flow estimates due to the use of what TKN considers to be the use of insufficiently conservative input values for intact bedrock, hydraulic conductivity value (K value), recharge rates (i.e. the proportion of mean annual precipitation that infiltrates to groundwater) and water table elevation. TKN expressed concern that the potential under-prediction of dewatering rates could lead to a larger water balance surplus than what is predicted in the Application (i.e. more water would be sent to the TSF). TKN questioned whether the KUG Project TSF and water treatment facility would have the capacity and capability to accommodate higher inflows.

In response to TKN's concerns, AuRico conducted an analysis using higher K values, rates of recharge and water table elevations (see "20161110_KUG_Comments_TKN_Hydrogeo_Lorax Memo" for details). AuRico found that increasing the K value by an order of magnitude would not produce a reasonable calibration for the groundwater model. The model would remain calibrated with small changes in recharge rates, but runoff estimates suggest the current recharge rates are reasonable. The analysis concluded that the reasonable upper limit to dewatering rates at the end of operations would range from 42-47 L/s, which is up to 20% higher than the base case (the Application base case is 39 L/s and upper case is 42 L/s). Additionally, AuRico calculated that when 100% of the ephemeral drainage is captured there would be an annual increase of 4 L/s in underground flows, with the largest increase in

monthly flows around 15 L/s for the month of June. AuRico noted that these new higher ranges would be considered in the development of a new upper case for the groundwater model for permitting.

AuRico conducted two additional sensitivity analyses whereby underground dewatering rates were increased by two (147 L/s) and five (367 L/s) times across the entire life of mine (but also noted that an increase in dewatering rate by five times the base case would be beyond any reasonable upper estimates of mine dewatering; see "20161109_A.1_KUG Action Item 3 Sept 8 2016_UG Dewatering Sensitivity_Memo"). The evaluation predicted that the metals treatment would need to be increased to 240 L/s and 602 L/s to accommodate an increase in dewatering rates by two and five times respectively (Se treatment also would need to be increased). AuRico noted that the MR treatment plant planned for the KUG Project would not be designed for these capacities, but would be modular in nature such that additional capacity could be added if required. In terms of water quality, no additional COPCs were identified for the scenario of increasing the dewatering rate by two times (i.e. AuRico predicts that doubling the dewatering rate would not have any impacts to water quality). For the increase of five times scenario, nitrite and Se were identified as additional COPCs in the operations and closure phases in Attichika Creek.

Concerning the capacity of the KUG Project TSF, AuRico explained that the KUG Project TSF would have five years of excess water storage capacity for operational years I through to 6. Then the excess storage capacity would decline from 4 years to 1 year, through operational years 7 to 11 (see "20161116_A.1 KUG Comment MEM-042.1_Round 2_TSF Storage_Memo").

NRCan stated that it was satisfied that the upper bound dewatering rates would be considered in permitting.

MEM and ENV expressed concerns about the uncertainty associated with various technical assumptions used to calibrate the steady-state groundwater model for baseline conditions. For example, they noted that the baseflow number used in this model was the winter minimum, as opposed to an average baseflow number. Using the lower winter minimum value might have caused the recharge rates in the model to be too low (because recharge rates are tied to the baseflow). This then would have implications for predictions of mine dewatering flows that are pumped into the KUG Project TSF during construction through to closure. The underground mine dewatering provides the greatest contribution of water to the KUG Project TSF during operations. ENV noted that the highest risk would be during construction when the volume of water to be discharged from the KUG Project TSF is the largest and no water treatment is planned from the KUG Project TSF prior to discharge (however, there is Se treatment of waters pumped into the KUG Project TSF from the SeCP), and at the end of operations

and beginning of closure when there would be very little extra water storage capacity available in the KUG Project TSF. MEM recommended that AuRico estimate a reasonable range for average annual baseflow that incorporates the uncertainty associated with individual measurements and justify why using dewatering rates estimated from the groundwater model recalibrated to upper-bound baseflow was not conducted as a sensitivity scenario.

AuRico estimated an average annual baseflow using two methods, both of which yielded average annual baseflow within about 10-15% of winter baseflows (which is what was used in the Application). AuRico noted that annual baseflows could vary by up to +/- 15% on a year to year basis. AuRico noted that an upper bound dewatering rate based on a finer range of intra-annual and inter-annual baseflow and that considers runoff entering the cave zone (from the ephemeral drainage) would be considered in permitting.

MEM and ENV reviewed AuRico's analyses and noted that they thought they were satisfactory for the EA stage, but that ongoing collection of climate information and additional work on the water balance model would be required for MA permitting. Specifically, ENV stated that the water models (water balance and groundwater models) completed for the Application relied on assumptions for key input parameters, such as orographic factor and recharge by elevation, that were estimated largely using regional data[11].While the regional data provided reasonable estimates for input assumptions for the EA, ENV expects that these estimates will be refined with ongoing site data collection (of concurrent climate information at the KN and KS stations to verify the orographic gradient at the site) to reduce the uncertainty associated with the water modelling results during the permitting phase.

EAO notes that a water balance model and water management plan are requirements of the Mining Code regulated by MEM, and that a more detailed review of site water balance (including inflows into the cave zone and the KUG Project TSF) will be considered in permitting. EAO also notes that the Environmental Monitoring Committee, as proposed in an EAC condition would be required to discuss KUG Project TSF design, operations and monitoring.

Given the sensitivity analyses AuRico conducted, the additional storage capacity in the KUG Project TSF, the capacity of the MR treatment to treat at a higher rate, if necessary, and the fact that more refined modelling would be conducted during the MA and EMA permitting stage to predict water balance on site, EAO is satisfied that this issue has adequately been addressed for the EA stage.

[11] An orographic factor is defined as the % increase in precipitation over 100 m increase in elevation due to the influence of mountainous terrain on rain and snowfall patterns.

Geochemical Source Terms

During the EA, MEM asked for additional information and assumptions regarding how AuRico derived the following key geochemical source terms: waste rock from the access and decline tunnels, tailings supernatant, ore stockpiles, highwall, tailings beach (including the sub-aerial component identified in the updated feasibility study), and PAG tailings. Additionally, MEM posed questions about why certain geochemical source terms were not included in the water quality model, namely seepage from the live stockpile and temporary stockpiles, and a flushing term from the KUG Project TSF highwall. AuRico's responses and associated analyses for some of these issues are presented below. TKN expressed concern that several potential sources of contamination may not have been incorporated into the water quality model, such as post-closure leakage from the decline plug (which is addressed above), flooding of the underground mine at closure, and acidification of some of the Takla and/or Hypogene rock units. In order to address this concern, AuRico conducted an assessment regarding the concern that the underground rock could acidify faster than predicted.

Stockpiles

AuRico clarified that contact flows from the temporary portal stockpile are assumed to report to Kemess Creek and are incorporated into predictive modelling; there is no pathway of interaction from the live ore stockpile to groundwater; and the pre-production and live ore stockpiles are not expected to interact with the surface water quality VC and were not included in the predictive water quality modelling as they are temporary, have a high turnover rate and contact flows would be collected. Instead these stockpile areas in the Application were represented within the plant site runoff, which is captured by a water management pond for makeup water for the mill, ultimately mixing with the tailings tram, which are then directed to the KUG Project TSF to be used as mill process water.

AuRico predicted total contact flows (surface runoff plus infiltration) and corresponding geochemical loadings for stockpiles. Results indicate that if all of the contact flows from the stockpiles were to report directly to the KUG Project TSF this would on average account for less than 1.5% of total inflow to the KUG Project TSF. Corresponding monthly geochemical loadings produced from the stockpiles are parameter specific and would represent ranges of <1% to ~3% of total monthly loadings to the KUG Project TSF. AuRico stated that these model results indicate that inclusion of total contact flows from temporary stockpiles would not change the conclusions of the effects assessment presented in the Application. AuRico noted that total contact flows (runoff plus infiltration) and associated geochemical loadings from all stockpiles will be included in the predictive water balance and water quality models to support permitting.

Highwall: Flushing Term from the KUG Project TSF highwall and Conservatism of Source Terms

AuRico provided additional information regarding the KUG Project TSF highwall loading term calculation.

In responding to TKN and MEM's comments regarding the highwall, AuRico learned that it had made a conservative error in their highwall source term loading calculations that were ultimately used in the water quality modeling for the KUG Project TSF. The EA highwall loading model overestimated PAG contributions by roughly 30% and therefore provides an upper bound and highly conservative estimate of potential closure water quality in the KUG Project TSF.

MEM advised EAO that the information provided by AuRico regarding the above noted geochemical source terms adequately addressed their concerns. They noted that a contingency plan for each of the ore stockpiles in the event of mine closure would be required for MA permitting, in addition to updating predictive water balance and water quality models with any updated geochemical information.

Acidification of some of the Takla and/or Hypogene Rock Units

TKN were concerned that the underground rock may become acidic faster than anticipated as AuRico assumed that two of the PAG rock units (Takla and Hypogene) would not become acidic.

AuRico noted that the mining disturbance of subsurface rock is substantially limited by the block caving approach as compared to more traditional open pit or underground mining operations where subsurface sulphide waste material is highly disturbed and ultimately subject to full atmospheric conditions. For the KUG Project, gossanous Takla and Takla units would remain in situ during mining; the primary altered conditions would be the depression of the water table and fracturing of the rock mass within the subsidence zone. Hypogene ore would be exposed to atmospheric conditions underground; however, this material is removed and processed through the mill and therefore has limited time of exposure. AuRico provided additional information on the laboratory and field testwork of the rock units, and concluded that changes in Gossan (the source of acidification) reactivity and resultant seepage/drainage water quality, as a consequence of panel cave mining, are not anticipated.

AuRico had an external review to test the validity of its conceptual model of limited oxygen ingress to depth during panel cave mining. The external review concluded that it is unlikely that there would be convective movement of oxygen within the cave zone during the caving process, and it is even less likely to continue after mining is complete.

AuRico concluded that it strongly considers the likelihood of developing acidic conditions within the cave zone to be very low. This conclusion is based on existing testwork and expert opinion supported from extensive experience in similar panel cave projects.

EAO notes that geochemical source term issues are ultimately about water quality predictions. As noted above, AuRico is proposing Se and metals treatment of water in the KUG Project TSF prior to discharge. EAO is proposing an EAC condition requiring the treatment of effluent from the KUG Project TSF for metals and Se and is also including water treatment in the CPD for the KUG Project. As mentioned above, water quality monitoring would also be discussed by the Environmental Monitoring Committee. In consideration of these proposed conditions, in addition to the detailed surface and groundwater monitoring that would be required in the MA and EMA permitting processes, EAO concludes the issues related to geochemical sources terms have been adequately addressed for the EA stage.

Water Quality and Treatment

Se in Waste Rock Creek

Due to the effects of the past producing KS, Se levels in Waste Rock Creek are currently above the WQG of 2 µg/L (current conditions reach approximately 90 µ/L). The Application predicts that Se treatment will end the first year of post-closure and that the predicted post-closure levels in Waste Rock Creek would be much higher (~60 µ/L; see Table 11.6-5 of the Application) than the WQG.

The current KS effluent permit for Waste Rock Creek does not include a numeric threshold for Se levels, but states that the “ultimate management goal of a self-sufficient population of Dolly Varden char in lower Waste Rock Creek that utilizes available habitat” must be achieved. “Use of this results-based goal recognizes that the WQG of 2 µg/L Se will not be applied as a legal limit”.

TKN expressed concerns about the lack of a quantifiable water quality objective for Se in Waste Rock Creek for use in the EA of the KUG Project. They indicated that this hampered their ability to accurately assess impacts to water quality. TKN recommended that a Se concentration limit should be used in Waste Rock Creek for use in the EA which is protective of aquatic life in Waste Rock Creek. In the interim, they recommend that the WQG be used.

In response, AuRico noted that Se is identified as a COPC for the KUG Project in the closure and post-closure periods only because the water quality model allows the KS SeCP to be directed to Waste Rock Creek starting in closure. The Se loadings are originally from KS, but they are appearing as a KUG Project residual effect due to water

management decisions related to the KUG Project (i.e. that contact water from the SeCP would stop being pumped to the KUG Project TSF in closure and be directed to Waste Rock Creek). Se from KS is being managed as part of the closure/post-closure phase of KS and is achieving current objectives identified in the existing effluent discharge authorization. As such, AuRico stated that use of the existing Se concentration within Waste Rock Creek for assessment of KUG Project related effects within Waste Rock Creek is considered to be appropriate. AuRico further explained that, at the time of post-closure, the KUG Project would discharge waters into Waste Rock Creek with Se concentrations less than or equal to those of Waste Rock Creek (at that time, which would cause a dilution effect of Se in Waste Rock Creek) and would meet all discharge permit requirements for release of the KUG Project TSF water.

In consideration of TKN's strong concern about this issue, the already high levels of Se in Waste Rock Creek and AuRico's commitment that the KUG Project would not add to Se concentrations in the creek, EAO proposes a an EAC condition that would require AuRico to ensure that Se concentrations of the discharge to Waste Rock Creek from the TSF during post-closure would not incrementally increase Se concentrations in Waste Rock Creek.

KUG Project Water Quality

More generally, TKN raised concerns that in the updated feasibility study, AuRico now predicts exceedances of additional COPCs, including Cd and total and dissolved Al in Attichika Creek over several years in construction and operations. TKN requested that AuRico commit to meeting WQGs, monitor water quality to assess levels and adjust the treatment approach if exceedances are observed. TKN also expressed concerns that AuRico predicts that water treatment would only be required for six years into closure. After this time, AuRico predicts that treatment would cease and water from the TSF would be released via the spillway into Waste Rock Creek. TKN therefore wanted to highlight that long-term water treatment should continue for as long as necessary to ensure TKN's water quality objectives continue to be met.

AuRico indicated that the water management plan during all stages of the KUG Project is to treat water that will be discharged from the KUG Project according to a receiving environment objective and discharge criteria that would be established for all COPCs through the EMA permitting process. Regarding closure, AuRico indicated that it would treat water until water quality is of sufficient quality to be discharged without treatment, as would be required by ENV.

EAO notes that in the Application, water treatment was the basis for the analysis and EAO has no information on what the potential effects of the KUG Project would be in the absence of treatment. Given the premise on which the EA was based, as well as TKN's

concerns, EAO is proposing an EAC condition requiring AuRico to treat the effluent from the KUG Project TSF for metals and Se to meet WQG or SBEB. The Environmental Monitoring Committee, as proposed in an EAC condition would also discuss closure planning and water management and water quality monitoring.

Monitoring

TKN suggested changes to AuRico's proposed water monitoring program in order to be able to assess changes to water quality from current conditions and throughout the life of mine to ensure no adverse effects to Amazay Lake, given its spiritual and cultural importance to TKN. They recommended that monitoring be conducted for a sufficient length of time to accurately understand current conditions, and that additional monitoring stations and frequencies should be required as follows:

a) Monitor Amazay Lake at a specified monitoring location at least quarterly; and
b) Re-establish inactive monitoring stations DLI1A, LDI2, DLI4, and DLI5 (which are on tributaries to Amazay Lake, which TKN notes could be potential groundwater flow paths from the subsidence zone) and sample these at least quarterly.

TKN also recommended additional groundwater monitoring systems to better monitor groundwater conditions and potential KUG Project effects, such as the following: overburden or shallow bedrock monitoring next to water bodies in the East Cirque catchment; wells at different depths to evaluate connectivity; and wells outside of subsidence zone to monitor drawdown and groundwater quality.

In consideration of TKN's strong concerns about potential impacts to Amazay Lake, and AuRico's commitment that the KUG Project would not affect Amazay Lake, EAO is proposing an EAC condition requiring AuRico to develop an Amazay Lake monitoring plan including surface and groundwater monitoring, in consultation with FLNRO, MEM, ENV, and TKN. However, as it is important to allow subsequent design and permitting to identify the details of the monitoring required, specific sites and monitoring methods identified by TKN are not prescribed in the proposed EAC condition.

Treatment Contingencies

The proposed Se treatment plant (Selen-IX) has never been used in a full scale treatment facility. The Working Group raised questions regarding contingencies and back-up plans if the plant does not work as intended (e.g. if it does not work at all, or if treatment does not achieve WQG), and what water quality predictions would be without treatment. AuRico responded noting the following as mitigations to the risk of treatment not meeting WQG:

- The plant is designed to reduce Se levels to < 1 µg/L at discharge, whereas the WQG for Se is 2 µg/L (i.e. there is a “buffer” if the plant does not always perform as intended);
- A pilot was conducted using the Selen-IX technology to treat existing KS pit (which would be the KUG Project TSF) water spiked with additional Se, SO_4 and Cl to levels that would be the most contaminated the treatment facility would be anticipated to treat through the life of mine. The test was run for two months of continuous operation and demonstrated the ability to treat water to <1 µg/L;
- Se treatment is planned to begin during the construction phase (two years before operations), which would allow time for any problems to be identified and resolved prior to operations. During this period if effluent did not meet WQGs it could be directed back to the KUG Project TSF to be treated again;
- Once operations have begun, there would be capacity in the KUG Project TSF to retain water for several years before discharge would be necessary. Therefore, there is additional time during operations to troubleshoot any issues that might arise; and
- The proposed Se treatment is modular and could be scaled (i.e. could add treatment capacity if necessary).

ENV did not require further information about the Se treatment proposal for the EA stage, but noted that additional information on the treatment process and long term disposal of sludge would be required for permitting.

Additionally, ECCC expressed concerns about the amounts of contact water that would be discharged into Attichika Creek without treatment (volumes in excess of the plants’ treatment rates would bypass treatment) and recommended that AuRico specify the trigger for increasing the Se treatment capacity in addition to explaining how this would be monitored. ECCC also recommended that water that does not meet permitted discharge limits (as determined in the EMA permit) be retained in the KUG Project TSF until adaptive management strategies can be implemented. Lastly, ECCC recommended that AuRico compare actual discharge water quality to the model predictions to facilitate ground-truthing of the model results for future project stages.

EAO notes that water quality monitoring would also be discussed by the Environmental Monitoring Committee and during the EMA permitting stage, ENV would specify the water quality parameter levels that could cause AuRico to increase their treatment levels and establish a specific water quality monitoring program. However, to address these concerns, EAO is also proposing an EAC condition requiring AuRico to treat the effluent from the KUG Project TSF for metals and Se to meet WQG or SBEB.

Uncertainty in implementation of EA commitments and conclusions

Throughout the EA, TKN raised several concerns about project design and proposed specific conditions for the implementation of measures proposed at a conceptual level in the EA to ensure the outcomes predicted in the EA. However permitting agencies expressed concern that these technical details would be determined through permitting. EAO acknowledges that in consideration of detailed project design information, permitting would refine details discussed in the EA such that uncertainty exists as to whether these details would ultimately be implemented as discussed in the EA.

To address these concerns, EAO is proposing an Environmental Monitoring Committee where AuRico would document for TKN and regulators how it addressed key EA concerns during detailed design for its permitting applications and in the development of management plans. The EMC would provide a forum for information sharing, and discussion of topics of interest to TKN to ensure that all parties are involved in the ongoing development of the mine, mitigation and monitoring measures and adaptive management.

The Environmental Monitoring Committee terms of reference are to be set so to avoid duplication of other processes (e.g., Mine Development Review Committee or AuRico and TKN's own committees). In addition, EAO notes that EAO and AuRico both have a collaborative relationship with TKN that will continue for the life of the KUG Project, and include discussion on implementation of conditions and any future KUG Project changes requiring amendments to the EAC should one be issued.

3.3.3 Analysis and Conclusions

3.3.3.1 *Residual Effects*

EAO concludes that after the implementation of mitigation measures, the KUG Project would have the following residual adverse effects to water:

- Groundwater quantity & surface hydrology:
    - Decreases in groundwater levels around the underground development and flows to East (until project year 60) and Central Cirque creeks;
    - Increase in groundwater contribution to East Cirque Creek (project year 60 onwards);
    - Groundwater seepage to Kemess Creek and Waste Rock Creek from the KUG Project TSF from operations onwards;
    - Streamflow increases in Attichika Creek during the construction phase; and

    - Streamflow increases and regime alterations[12] in Waste Rock Creek during closure and beyond.

- Groundwater quality – increases in levels of the following COPCs:
    - Underground mine area (LSA1): SO_4, Cd, Cu, Mn, Ni, Se and Zn; and
    - TSF area (LSA2): ammonia, nitrite, nitrate, SO_4, Al, As, Cd, Cu, Fe Mn, Ni, Pb, Se and Zn in the fractured bedrock down gradient of the TSF.

- Surface water quality - increases in levels of the following water quality parameters and residual effects from sedimentation and erosion:
    - Attichika Creek: Total and dissolved Al and Cd, Total Cu – construction and operation;
    - Waste Rock Creek: Nitrate, Total Cu and Se – closure and post-closure; Total Al and Mo – post-closure;
    - East Cirque Creek: Total Co, Cr, Cu, Fe, Zn – post-closure; and
    - Central Cirque Creek: Total and dissolved Al, total Fe - post-closure.

[12] Streamflow "regime" is a catch-all phrase for the characteristics of a given watershed (flow magnitude, timing, annual runoff etc.)

Table 11: Summary of Residual Effects for Water

VC	Characterization Criteria (See Appendix 1 for definitions of the characterization ratings)								
	Context	Magnitude	Extent	Duration	Reversibility	Frequency (of residual effect)	Likelihood	Significance Determination	Confidence
Groundwater Quantity and Surface Hydrology	**Neutral:** For groundwater quantity or surface hydrology there is not a ready measure of context (or resilience).	**High:** Surface and groundwater levels and flows would exceed the range of current variation by a substantial amount during the post-closure period: • Underground mine area: final water levels will remain lower than baseline (1590 masl vs 1616-1694 masl baseline); • East (increased 28%) and Central Cirque Creek (decreased 37%); and • Waste Rock Creek (increased by an average of ~ 37% to 290%). • The KS pit / KUG Project TSF would change from a groundwater sink to source (i.e. hydraulic	**Discrete/Local:** Discrete - All effects limited to the watershed within which they occur (East and Central Cirque Creek, and Waste Rock Creek watersheds). Local – Seepage from the TSF would be limited to LSA2.	**Permanent:** Residual effects to surface and groundwater levels and flows would be permanent (except for decreases to East Cirque Creek, which would switch to increases in year 60).	**Irreversible:** Residual effects to surface and groundwater levels and flows would be irreversible. Although decreased flows to East Cirque Creek switch to increased flows in year 60, this predicted reversal does not bring flows back to baseline levels. Therefore EAO considers this residual effect to be irreversible.	**Continuous:** Effects would occur continually through to post-closure (except for decreases to East Cirque Creek, which would occur until year 60).	**High:** There is a high likelihood of the predicted residual effects occurring for the reasons outlined below. **Surface hydrology and Groundwater quantity (LSA1):** The existing stream flow and groundwater regimes are well understood (in part due to information from KS and the proposed KN mines), the water balance models accurately replicates local flows (surface hydrology only), and many water balance and groundwater model realizations were run to evaluate the sensitivity of predicted effects to variability in model inputs. **Groundwater quantity (LSA2):**	**Not Significant:** Although the magnitude for all predicted residual effects to groundwater quantity and surface water hydrology (except for Attichika Creek) are high in magnitude, would persist into post-closure, are irreversible and continuous, they would only affect small drainages (the impacts of changes to water levels do not extend very far downstream to the next water assessment node). For Attichika Creek, the effects would be temporary, reversible and only slightly above current levels.	**High:** EAO has a high level of confidence in the groundwater quantity and surface water hydrology effects assessments and significance determinations as the assessments were based on robust models that employed a variety of sensitivity runs to understand the impact of varying input parameters. For groundwater quantity in LSA2, there is a good understanding of the effects of tailings deposition in TSFs, groundwater levels and implications for seepage.

VC	Characterization Criteria (See Appendix 1 for definitions of the characterization ratings)								
	Context	Magnitude	Extent	Duration	Reversibility	Frequency (of residual effect)	Likelihood	Significance Determination	Confidence
		gradients would be completely reversed).					The final water level in the KUG Project TSF is well known, the groundwater model includes the results of hydraulic testing in the bedrock in the south wall of the pit (though which seepage is predicted) and multiple runs of the TSF model were run to predict changes to groundwater seepage from various parameter inputs.		
		Medium (Attichika): Flows would increase by 5-5.3% for the 90th percentile model output.	**Discrete (Attichika):** Residual effects would be limited to the Attichika watershed.	**Short-term (Attichika):** Increased flows would last four years.	**Reversible (Attichika):** Increased flows would stop once the pit is sufficiently dewatered to be used as a TSF.	**Regular (Attichika):** Increased flows would occur regularly (May to October each year of dewatering).			
Groundwater Quality	**Neutral:** Baseline groundwater quality has not been affected by KS	**High:** LSA1: Deep groundwater quality will increase in dissolved solids, SO_4 and several metal concentrations well above baseline (notably SO_4 and Cu; which would increase above baseline by a factor of 18 and 57 respectively). LSA2: Seepage	**Discrete:** LSA1: Effects would be mostly limited to the subsidence zone and upper East Cirque Creek drainage. LSA2: Effects would be limited to the area between the TSF and Kemess Creek.	**Far Future:** Effects to deeper groundwater quality (LSA1) and fractured bedrock groundwater quality (LSA2) would last past post-closure.	**Irreversible:** LSA1: It would take thousands of years to replace the impacted groundwater and thereby changes its quality. LSA2: Continual loadings from the TSF highwall runoff would make effects irreversible.	**Continuous:** Effects would occur continually through to post-closure.	**High:** There is a high likelihood of the residual effects to groundwater quality. The Application conducted robust groundwater and geochemical testing. In LSA1, the Gossan material (which drives much of the water quality in the underground mine area) is well characterized. Decline plugs are	**Not Significant:** Although residual effects to groundwater quality in deep groundwater in the underground mine area and seepage from the TSF to Kemess Creek are high in magnitude and irreversible, the geographic extent of these effects would be limited to East Cirque and Kemess Creeks.	**High**: EAO has a high level of confidence in the groundwater quality assessment and significance determination. There is substantial data about the groundwater currently passing through the underground mine area. Both small and field scale testing has

VC	Characterization Criteria (See Appendix 1 for definitions of the characterization ratings)								
	Context	Magnitude	Extent	Duration	Reversibility	Frequency (of residual effect)	Likelihood	Significance Determination	Confidence
		would occur through the preferential flow path of fractured bedrock through the TSF south wall and east dam to Kemess Creek; predicted groundwater quality would exceed the range of natural variability.					used frequently in mines and are anticipated to work as planned to flood the underground area. In LSA2 there has been extensive testing of groundwater downgradient from the TSF and as it is very likely that the TSF will contain elevated COPC levels, there is a high level of confidence that seepage from the TSF will change groundwater concentrations.	Additionally, the resultant loadings to these creeks would be very minor. In the underground mine area deep groundwater is only predicted to have a minor contribution to East Cirque Creek as compared to the flow from shallow groundwater in the Gossan.	produced similar results regarding the influence of the rock units in the area on water quality. Similarly, groundwater quality downgradient of the TSF in the bedrock has been routinely measured and it is very likely that it will be affected by seepage from the TSF, which would contain elevated levels of COPCs.
Surface Water Quality	**Attichika Creek** (Total and dissolved Al and Cd, total Cu): **neutral** – current concentrations can vary seasonally up to an order of magnitude so the receiving environment may be able to respond and adapt to the predicted COPC increases from the KUG Project.	**Attichika Creek** (Total and dissolved Al and Cd, total Cu) **– medium-high** **Waste Rock Creek** • Nitrate – **low** • Total Al, Cu, Mo – **high** • Total Se - **low** **East Cirque Creek** (Total Co, Cr, Cu, Fe, Zn) – **medium**	**Attichika Creek** (Total and dissolved Al and Cd, total Cu): **local** – effects are limited to the LSA and do not extend downstream of Attichika Creek. **Waste Rock Creek** (Nitrate, Total Al, Cu, Mo, Se)**: discrete** – the effect does not extend beyond Waste Rock Creek in the LSA.	**Attichika Creek** (Total and dissolved Al and Cd, total Cu): **medium-term** – the effects are predicted for certain years in the construction and operation phases. **Waste Rock Creek** (Nitrate, Total Al, Cu, Mo, Se)**: far-future** – the effects are predicted to last into post-closure.	**Attichika Creek** (Total and dissolved Al and Cd, total Cu): **reversible** – parameters are predicted to decrease in operations and no longer be identified as COPCs. **Waste Rock Creek** (Nitrate, Total Al, Cu, Mo, Se)**: irreversible** – as the effects are predicted to	**Attichika Creek** (Total and dissolved Al and Cd, total Cu): **sporadic** – The parameters are identified as COPCs only within specific months or seasons. **Waste Rock Creek** • Nitrate, Total Se: **continuous** – predicted effects in the post-closure	The Application presents the following likelihood ratings that EAO agrees with. **High:** > 80% chance of effect occurring. **Moderate:** 40-80% chance of effect occurring. **Low:** < 20% chance of effect occurring. The likelihood	**Attichika Creek** (Total and dissolved Al and Cd, total Cu): **not significant** – effects would be local, short term, sporadic and reversible. **Waste Rock Creek:** • Nitrate: **not significant** – predicted effects are within the range of current	**High** (All Predicted Residual Effects) The water quality effects assessment used a large database of existing water quality data and high quality input data into the modelling. It employed industry standard modelling software and used multiple sensitivities to reduce

VC	Characterization Criteria (See Appendix 1 for definitions of the characterization ratings)								
	Context	Magnitude	Extent	Duration	Reversibility	Frequency (of residual effect)	Likelihood	Significance Determination	Confidence
	Waste Rock Creek • Nitrate: **neutral** – • current concentrations can vary up to an order of magnitude so the receiving environment may be able to respond and adapt to the predicted nitrate increases from the KUG Project. • Total Al, Cu, Mo, Se**: neutral-high** – current concentrations of these COPCs are high year round so the receiving environment is possibly more sensitive to additional increases in these COPCs. **East Cirque Creek** (Total Co,	**Central Cirque Creek** (Total and dissolved Al, total Fe) – **medium - high** **Sedimentation and erosion: high** – effects would likely be outside the range of current variation and above WQG (because levels are currently low).	**East Cirque Creek** (Total Co, Cr, Cu, Fe, Zn): **discrete** – the effect does not extend down to Attycelley Creek. **Central Cirque Creek** (Total and dissolved Al, total Fe): **discrete** – the effect does not extend down to Attycelley Creek or Amazay Lake. **Sedimentation and erosion**: **discrete to local** – planned disturbance is limited to the project area or LSA	**East Cirque Creek** (Total Co, Cr, Cu, Fe, Zn): **medium-term** – the effects are predicted for 2 to 5 years in the post-closure phase. **Central Cirque Creek** (Total and dissolved Al, total Fe): **far-future** – the effects are predicted in the post-closure phase. **Sedimentation and erosion**: **short-term** – limited to the duration of planned surface disturbances in construction and closure	last into post-closure the effect is considered permanent. **East Cirque Creek** (Total Co, Cr, Cu, Fe, Zn): **partially reversible (i.e. the magnitude and / or frequency of the effect decreases or returns to existing conditions for some model timesteps but not all) to irreversible** – the effects are predicted for several years only near the end of post-closure. **Central Cirque Creek** (Total and dissolved Al, total Fe): **permanent** – the effects are predicted to occur at the end of post-closure. **Sedimentation and erosion**: **reversible** – the implementation of remedial / corrective measures for	period in several months. • Total Al, Cu, Mo: **regular –** effects are predicted in May of most years during the post-closure period. **East Cirque Creek** (Total Co, Cr, Cu, Fe, Zn): **sporadic** – the effects are only predicted for December of a few years and at <30% frequency. **Central Cirque Creek** (Total and dissolved Al, total Fe): **sporadic** – the effects are predicted at less than 30% in post-closure and only in certain years in certain months. **Sedimentation and erosion**: **regular –** sedimentation and erosion are most likely at high flow times of the year.	rating of residual effects to water quality are based on the sensitivity scenarios in which the COPC is identified. For example, a COPC identified in both the base and upper case would have high likelihood of producing a residual effect. If it was only identified in the upper case then it would have a moderate likelihood of producing a residual effect. --- **Attichika Creek** (Total and dissolved Al and Cd, total Cu)**:– high** **Waste Rock Creek:** • Nitrate – **low** • Total Al – **moderate** • Total Cu, Mo – **high** • Total Se - **low** **East Cirque Creek** (Total Co,	variation and effects are not predicted downstream (i.e. the effect is discrete). • Total Al, Cu, Mo: **not significant** – these COPCs are identified mainly due to model conservatism and are not predicted downstream (discrete effect). • Total Se: **not significant** – predicted effects would be within the range of current variation and would not be present downstream. **East Cirque Creek** (Total Co, Cr, Cu, Fe, Zn): **not significant** – the predicted effects are within the upper limits of current variation and discrete in extent.	uncertainty. The assessment also used the results of laboratory bench scale testing to inform the metals and Se removal treatment in the models. For sedimentation and erosion, there is a high level of understanding of the causes and effects of sedimentation and erosion. Additionally, the effectiveness of best management practices is well understood and is reasonably effective.

VC	Characterization Criteria (See Appendix 1 for definitions of the characterization ratings)								
	Context	Magnitude	Extent	Duration	Reversibility	Frequency (of residual effect)	Likelihood	Significance Determination	Confidence
	Cr, Cu, Fe, Zn): **neutral-low** – existing concentrations are frequently above guidelines year round and can vary by an order of magnitude so the receiving environment may be able to respond and adapt to the effect. **Central Cirque Creek** (Total and dissolved Al, total Fe): **neutral-low** – background concentrations can vary by more than an order of magnitude so the receiving environment may be able to respond and adapt to the effect. **Sedimentation and erosion: neutral** – levels of TSS and turbidity are low in the LSA but they vary seasonally and				sedimentation and erosion could reverse effects.		Cr, Cu, Fe, Zn) – **moderate-high** **Central Cirque Creek** (Total and dissolved Al, total Fe) - **moderate** **Sedimentation and erosion**: - **moderate**	**Central Cirque Creek** (Total and dissolved Al, total Fe): **not significant** – predicted effects would be sporadic, within the upper limits of current variation and discrete in extent. **Sedimentation and erosion**: **not significant** – predicted residual effects from sedimentation and erosion would be limited in spatial and temporal extent and largely effectively managed by mitigation measures and remedial / corrective measures should the effect occur.	

VC	Characterization Criteria (See Appendix 1 for definitions of the characterization ratings)								
	Context	Magnitude	Extent	Duration	Reversibility	Frequency (of residual effect)	Likelihood	Significance Determination	Confidence
	are highest when erosion and sedimentation would likely to be highest (at times of higher overland flow).								

3.3.3.2 *Cumulative Effects*

The former KS is the only past, present or reasonably foreseeable project with effects on groundwater quantity and quality, surface water hydrology and surface water quality that could interact cumulatively with those from the KUG Project. As noted above, for the assessments of these VCs, the impacts from KS are included as part of current conditions ("baseline") for the KUG Project assessments, and therefore the predictions in the Application are cumulative in nature. For example, for surface water hydrology, the hydrological effects due to KS were incorporated into the streamflow assessments used for the KUG Project as the water balance and water quality models compared a without KUG Project (baseline including KS) and with KUG Project scenario. Therefore no additional quantitative cumulative effects assessment is required for any of the water VCs. The sections below include additional information of interest regarding ground and surface water quality.

Groundwater quality

As KS did not affect the groundwater in LSA1 (the underground mine area), there are no predicted cumulative effects to groundwater in this area.

KS is the only project that could potentially act cumulatively with groundwater effects from the KUG Project within the LSA2 boundary. KS operations changed overburden groundwater quality (mostly SO_4 concentrations and N species, i.e. nitrate and nitrite) downgradient of the KS open pit (which would be the KUG Project TSF) from temporary stockpiling of waste rock in the area. The Application predicts that there would be seepage from the KUG Project TSF to the surrounding area and seepage is predicted to migrate primarily through the fractured bedrock (i.e. it would be deeper than the areas previously impacted by KS). The effects from KS to groundwater quality from the KS open pit were in the overburden. The KUG Project is not anticipated to affect groundwater quality in the overburden. Given the predicted lack of interaction between groundwater effects from the KS pit to the overburden and KUG Project TSF to the fractured bedrock, EAO concludes that there will not be significant residual cumulative effects to groundwater quality.

Of note regarding potential cumulative impacts from groundwater quality is that seepage from both the KS TSF and the KUG Project TSF ultimately enters Kemess Creek. This could result in a potential cumulative effect to surface water quality in Kemess Creek under low-flow conditions (when groundwater discharge could have a higher impact as compared to normal flow conditions) from changes to groundwater quality. The Application and memo "20161129_A.1 KUG Comments EAO-005 CEA for Water VCs_Memo" note that groundwater quality effects from KS have already been

completely integrated into the KUG Project water quality assessments as current conditions. However, MEM noted that no monitoring wells are installed downstream of the KS TSF, and therefore the groundwater quality and associated potential cumulative effects to Kemess Creek have not been well defined. In particular, MEM stated that no data are available that allow for a determination of whether groundwater seepage quality has reached steady state and can be evaluated based on streamflow data or whether the source concentrations in the KS TSF tailings are still evolving. MEM communicated that this issue would be looked at further during permitting with consideration to KS and KUG Project interactions. However, MEM stated that any potential effects to low-flow stream water quality downstream of the KS TSF could likely be mitigated.

Surface water quality

As noted above in the background and issues sections, nitrate, total Se and total Al are identified as COPCs in Waste Rock Creek as a result of contact water from the KS SeCP being directed to Waste Rock Creek in the closure period onwards. Therefore although there is a KUG Project residual effect of these parameters in Waste Rock Creek, the source of this effect is from KS loadings and is due to water management decisions over the course of the KUG Project life of mine (i.e. where contact water from the SeCP will be directed and when). The Application predicts that concentrations of total Se in the KUG Project TSF would be lower than concentrations in Waste Rock Creek (i.e. water from the TSF would not have an incremental effect on concentrations of Se in Waste Rock Creek when it overflows in post-closure). EAO is proposing an EAC condition to ensure that discharge to Waste Rock Creek from the KUG Project TSF during post-closure would not incrementally increase Se concentrations in Waste Rock Creek.

3.3.3.3 *Conclusions*

Considering the above analysis, and having regard to the mitigation measures identified in the CPD and TOC including the proposed conditions listed below, which would become legally binding as conditions of the EAC, in addition to ground and surface water monitoring programs that would be required during permitting, EAO is satisfied that the KUG Project will not have significant adverse residual or cumulative effects on groundwater quantity or quality, surface water hydrology or surface water quality.

EAC conditions relevant to water include:

- Construction EMP, which would include requirements for sediment and erosion control measures;
- Se in Waste Rock Creek;

- Amazay Lake Monitoring Plan;
- a requirement for treatment of the effluent from the KUG Project TSF for metals and Se;
- staged discharge from KUG Project TSF to Attichika Creek on a monthly basis to a volume proportional to the Attichika Creek monthly streamflow and restricted to the open water months during construction; and
- the establishment of an Environmental Monitoring Committee.

3.4 Fish and Aquatic Habitat

3.4.1 Background

3.4.1.1 *Description of Valued Components*

Fish and aquatic habitat have the potential to be affected by the KUG Project during all phases as the KUG Project area encompasses several fish-bearing and non-fish-bearing streams, rivers, and lakes providing fish and aquatic habitat. Fish species provide an important food source for First Nations in the RSA. Potential effects to fish and aquatic habitat are related to project activities, specifically road and pipeline construction, water treatment, KS pit dewatering, effluent discharge from the KUG Project TSF and outflow from the SeCP.

AuRico selected three fish species as VCs, and three VCs within the aquatic habitat subject area (see Table 12). The effects assessment groups the VCs into subject areas because the effects on VCs are similar within the two selected study areas, and evaluates the effects and residual effects for fish and aquatic habitat, rather than for each VC.

These VCs were selected because:

- Fish species and their associated habitats were identified by First Nations as a traditional food source;
- Alteration of habitat, water quality, and quantity due to construction and operations has the potential to affect fish and aquatic habitat;
- Bull trout is a provincially blue-listed species indicating that they are sensitive to human activities; and
- Dolly Varden and bull trout have received considerable interest from the scientific community because both are present in sympatry (i.e., co-occur) in the Thutade Watershed despite inter-breeding of the species. Research in the Thutade Watershed has helped with the understanding of how these two species maintain species separation.

A complete description of the VCs, and indicators used in the assessment can be found in the Application in section 14.3.1.

Table 12: Selected Valued Components for Fish and Aquatic Habitat subject areas, and associated indicators

Subject Area	VC	Indicators
Fish	Adfluvial bull trout	- Fish habitat - Recruitment - Fish health
	Dolly Varden	
	Rainbow Trout	
Aquatic Habitat	Periphyton	- Primary productivity, abundance and diversity - COPC (water quality)
	Benthic Invertebrates	
	Sediment Quality	

3.4.1.2 *Study Area*

The LSA focused on watersheds within the immediate vicinity of the KUG Project, specifically East Cirque, Central Cirque, El Condor, Kemess, Waste Rock, Attycelley, and Attichika creeks, Amazay Lake and its outlet Amazay Creek (Figure 14.3-1 from the Application, and revised during Application review, see memo: “20160706_A.1 - KUG Comment FLNRO-003_Fish and Aquatic LSA_Memo”). The RSA focused on two watersheds in the larger area that could be affected by the KUG Project development and operations, including the Attycelley Watershed, the Attichika Watershed including Kemess Creek and tributaries, but excluding Thorne Creek. As well, Thutade Lake and the upper Finlay River to its confluence with the Firesteel River are included in the RSA (Figure 14.3-1 from the Application and revised during Application review).

3.4.1.3 *AuRico’s Assessment*

AuRico’s Fish and Aquatic Effects Assessment is in Chapter 14 of the Application. See Table 13 below for a summary of the current conditions in the watercourses within the RSA and potential effects. The Application identified the potential effects to fish and aquatic habitat as direct mortality, sedimentation and erosion, changes in surface water quantity and quality, and habitat loss. While these effects were identified, most were not considered residual effects because mitigation is expected to be effective (Table 13).

Table 13: Summary of Watercourses, Current Conditions, and KUG Project Components and Effects, and Predicted Residual Effects

Stream	Fish Species Present	Current Metal Concentrations Exceeding BC WQG	KUG Project Components and Effects	Predicted Residual Effect
East Cirque Creek Site: KN-12	None	SO_4, As, Be, Cr, Co, Cu, Fe, Se, Zn, Al-d, Cd-d, Fe-d	Base flow reduction during all phases due to underground mine dewatering. Seepage from underground mine reports in post-closure.	No
Central Cirque Creek (inlet to Amazay Lake) Site: KN-09	None	SO_4, Be, Cr, Co, Cu, Fe, Zn, Al-d, Cd-d, Fe-d	Base flow reduction during all phases due to underground mine dewatering.	No
Attycelley Creek Site: KN-06	Dolly Varden, Bull Trout, Rainbow Trout, Mountain Whitefish, Longnose Suckers, Slimy Sculpin	Be, Cu, Ni, Zn, Al-d, Cd-d	Downstream of East Cirque Creek, which receives underground mine seepage in post-closure.	No
Lower Attichika Creek Site: WQ-17	Dolly Varden, Bull Trout, Rainbow Trout, Mountain Whitefish, Longnose Sucker, Slimy Sculpin	Cr, Cu, Al-d	Immediately upstream of discharge location for treated effluent from the KUG Project TSF during construction, operation, and closure phases.	No
Lower Attichika Creek Site: WQ-18	Dolly Varden, Bull Trout, Rainbow Trout, Mountain Whitefish, Longnose	Cu, Al-d, Cd-d	Downstream of discharge location for treated effluent from the KUG Project TSF during all project phases.	Yes

Stream	Fish Species Present	Current Metal Concentrations Exceeding BC WQG	KUG Project Components and Effects	Predicted Residual Effect
	Sucker, Slimy Sculpin			
North Kemess Creek **Site: WQ-04**	Bull Trout, Dolly Varden, Rainbow Trout, Mountain Whitefish	Cu	No interactions with North Kemess Creek.	NA
South Kemess Creek	Bull Trout, Dolly Varden, Rainbow Trout, Mountain Whitefish	Not presented	No interactions with South Kemess Creek.	NA
Lower Kemess Creek **Site: WQ-01**	Bull Trout, Dolly Varden, Slimy Sculpin, Mountain Whitefish, Longnose Sucker	Cu, Al-d	KUG Project TSF seepage reports to Kemess Creek during all project phases.	No
El Condor Creek	Upper: Dolly Varden Lower: Dolly Varden, Rainbow Trout, Mountain Whitefish	None	Receiving environment for non-contact water management network (diversion channel and sedimentation pond) in the upper Kemess Lake Valley infrastructure during construction, operations, and closure. Receiving environment for surface discharges from access tunnel and underground portals in closure and post-closure.	No
Waste Rock Creek **Site: WQ-14F**	Above ORAR: None Lower: Bull Trout, Dolly Varden, Rainbow	Nitrate - NO_3, Nitrite-N, Cr, Se	KUG Project TSF seepage reports during operations through post-closure. Receiving environment for overflow from KUG Project TSF via a constructed	Yes

Stream	Fish Species Present	Current Metal Concentrations Exceeding BC WQG	KUG Project Components and Effects	Predicted Residual Effect
	Trout, Sculpins		spillway in post-closure.	

Al-d=dissolved aluminum, Cd-d = dissolved cadmium, SO4=sulfate, NO3=nitrate, NA=not applicable.

The Application identified the following potential interaction pathways to effects to fish and aquatic habitat:

- Direct mortality;
- Erosion and sedimentation;
- Habitat loss;
- Changes in water quantity; and
- Changes in water quality.

Direct Mortality

Construction activities during the installation and removal of the discharge pipeline and diffuser in lower Attichika Creek have the potential to cause direct mortality to fish. Installation of the discharge pipeline to lower Attichika Creek may cross a small seepage on the Attichika floodplain, which AuRico has treated as fish habitat in the Application, despite no fish presence during sampling in the fall of 2015.

Construction of the access road within the access corridor and upgrading of any existing roads in the KUG Project area may improve access to fishing locations to a limited extent on Lower Attichika Creek near the diffuser, while all other roads and access points would be within mine gates. While increased fishing pressure is possible, it is not expected to be a pathway for direct mortality relative to baseline conditions.

Habitat Loss

Removal of vegetation within the LSA during construction has the potential to alter and/or result in the loss of riparian and instream fish and aquatic habitat. The Application notes that the only contact between the KUG Project and fish and aquatic habitat is the proposed discharge pipeline that crosses a section of the Attichika floodplain to the discharge location on the mainstem Attichika Creek, which would require a total area of 0.2 ha across roughly 500 m of the floodplain.

Erosion and Sedimentation

Land disturbance during all phases of the KUG Project can potentially increase surface erosion and runoff, leading to increases in TSS, turbidity, nutrients, metals, and sedimentation in the receiving environment. Potential sources of erosion and sedimentation include:

- Construction of the access corridor, collar tunnel entrances, portal facilities, portal management infrastructure and mine site and portal diversion ditches and swales;
- Temporary stockpiling of waste and ore in the portal area in the Upper El Condor Creek watershed;
- Transport and deposit of waste rock from construction sites to the KUG Project TSF during construction;
- Use of access corridor and maintenance of access roads;
- Hauling of waste rock along the access corridor, and subsequent excavation of rock from the East Pit Quarry and Borrow 10 during operations;
- Decommissioning of underground infrastructure, access corridor and portal infrastructure and mine infrastructure and maintenance reclamation of roads during closure;
- Construction of the closure spillway during closure; and
- Installation and removal of water treatment plants and discharge pipeline to Attichika Creek during construction and post-closure.

Surface water quantity and quality are discussed in greater detail below as the following residual effects on the fish and aquatic habitat VCs were identified in the Application:

- Surface Water Quantity
    - Increases in surface water quantity in Attichika Creek during construction; and
    - Increases in surface water quantity in Waste Rock Creek during closure, and post-closure.
- Surface Water Quality
    - Change in total Cd concentrations in Attichika Creek, during construction;
    - Change in nitrate concentrations in Waste Rock Creek, during closure and post-closure;
    - Change in total Al and Cu concentrations in Waste Rock Creek during closure and post-closure; and

- Change in total Se concentrations in Waste Rock Creek during closure and post-closure.

While all waterbodies within the LSA were considered in the Application water balance model and surface water quality predictive model, the residual effects are predicted to be limited to those waterbodies identified in the table above using the screening parameters defined in the Application and described below.

Surface Water Quantity

A surface water balance model (Appendix 11-D of the Application) was used to predict local streamflow conditions at 17 assessment nodes within the KUG Project area and is detailed in the Hydrology Effects Assessment (Chapter 10, Figure 10.6-1 of the Application). The Application assumes a 5% uncertainty around model outputs, and only those model outputs that had a greater than 5% change in the 10^{th} to 90^{th} percentile cases, (i.e. fish populations and existing high quality habitat) were considered residual effects. More detail on the assessment of surface water quantity is included in section 3.3 of this report.

Reductions in water quantity flow of more than 5% to East Cirque and Central Cirque creeks were predicted but were not considered residual effects due to low quality habitat, low density and diversity of invertebrates, lack of fish populations and changes in base flows at both creeks are negligible at the next downstream assessment nodes.

Attichika Creek

The KUG Project TSF effluent discharge pipeline multi-port diffuser would be located on a long, straight section of Attichika Creek (Plate 14.4-1 of the Application). AuRico selected this location because locations farther upstream contain core bull trout staging and spawning areas and locations further downstream would involve stream crossings of extensive and complex wetland habitats along Attichika Creek at the base of Waste Rock Creek and downstream. AuRico consulted with TKN to determine the preferred waterbody of the discharge outlet, a process which included a report to TKN, as well as open house community meetings. AuRico noted in the Application (Chapter 4 Alternative Means of Undertaking the Project) that members of TKN overwhelmingly preferred the Attichika Creek location over other options presented (KS TSF, Thutade Lake, Finlay River, or a combination of locations).

The Application identifies a residual effect on the Attichika flow due to the effluent discharge from dewatering of the KUG Project TSF, treatment of water, and discharge into the creek during the construction. Predicted increases ranged from 0 to 5.3% (10^{th} and 90^{th} percentile respectively), and were within the range of model uncertainly (5%).

Although the water balance model indicates a low probability of occurrence, a 5% increase could occur in August to October during the four year dewatering process.

AuRico predicts that the increased flow downstream of the diffuser in Attichika Creek would not be detectible compared to current conditions, and therefore would not affect the bull trout population. Specifically, at the nearest known bull trout redd, or spawning nest sites 700 m downstream of the diffuser location; the changes would not be detectible.

Waste Rock Creek

Waste Rock Creek is a second-order tributary to lower Attichika Creek, and the lower 250 m of the creek are considered to be fish habitat. Waste Rock Creek drains an area of the KS site that includes the existing waste rock storage area. In 1998, KS began placing non-acid-generating waste rock in permanent storage in the upper watershed of Waste Rock Creek. The creek was previously used as habitat by Dolly Varden, but now has reduced water quantity, reduced spawning habitat availability and reduced population in Waste Rock Creek since the creek began being used for KS operations. AuRico has completed habitat compensation for the lost fish habitat in Waste Rock Creek.

According to the water balance model in the Application, during closure and post-closure phases, the Waste Rock Creek flow regime is altered by the overflows from the SeCP discharge and the filling of the pit and discharge via the closure spillway that are assumed to occur indefinitely (Chapter 10 of the Application). The 10^{th} percentile model outputs show closure phase flow enhancements ranging from 5% (August) to 141% (April) and increases of up to 183% in April for the 90^{th} percentile outputs (Table 14.6-3 of the Application). During post-closure, all KUG Project TSF surplus water would be directed to Waste Rock Creek as a result of the pit filling and discharging via the closure spillway. Post-closure flow increases range from 21% (August) to 290% (May) for 10^{th} percentile model results and up to 313% in May for the 90^{th} percentile outputs. The predicted changes in water flow should result in a net benefit to Waste Rock Creek Dolly Varden by creating better access from downstream locations, better overwinter flows, and increased habitat during some life history stages.

Currently several locations in the lower creek have been identified for potential spawning, but do not currently have the necessary flows to allow for spawning to occur. AuRico predicts that the higher flows in Waste Rock Creek during closure and post-closure would create better access for Dolly Varden from downstream locations, better overwinter flows and rearing habitat.

Surface Water Quality

The Application predicted water quality at each potentially affected creek or lake against WQG and if predicted water quality was greater than guidelines, the particular parameter was identified as a COPC in the Surface Water Quality Effects Assessment, (Chapter 11 of the Application and the updated feasibility study), that identified an additional three COPCs. The Application considers residual effects to fish and aquatic habitat for water quality parameters that were screened to be a COPC by the predicted base case model (median monthly water quality) and upper case model (95th percentile existing surface water chemistries). AuRico's assessment of residual effects on fish and aquatic habitat included comparison of predicted concentrations to the current variation in these waterbodies at each assessment node. Table 14.6-8 of the Application summarizes the COPCs that were screened in each assessment node during each phase of the KUG Project. The updated feasibility study introduced additional COPCs, but did not find additional residual effects. The Application and the updated feasibility study did not identify WQG exceedances that were within the current range of variation as residual effects. More detail on the assessment of surface water quality is included in section 3.3 of this report. Note that the Application used the term "natural variation" to represent the current variation within the LSA; however EAO uses the term current variation or current condition.

Attichika Creek

Surface water quality in Attichika Creek would be altered due to the KUG Project TSF discharge into the creek, with residual effects predicted during construction. This change in water quality is due to the use of an effluent discharge pipe that would be used during construction and operations, and decommissioned during closure. The outflow would be subject to metal treatment during construction, and metals and Se treatment during operations.

Patterns observed for surface water quality predictions at the assessment nodes on Attichika Creek are related to the predicted chemistry of the KUG Project TSF discharge as a function of time (e.g., accumulation of loadings over the life of the mine, effects of water treatment) and the timing of mine activities within each mine phase (Chapter 11 of the Application).

The Application and the updated feasibility study identified residual effects based on the upper case model (none were found in the base case). Upper case model predictions identify total Cd as a COPC in June and October for two years of construction (Year -2 and -1), both at the assessment node downstream from the proposed discharge location to Attichika Creek. At these nodes, during June and October of each year of construction, predicted upper case total Cd concentrations exceed the 95th percentile of

current conditions (Table 14.6-12). Concentrations at both locations also exceed the chronic guideline for the protection of aquatic life in June and October of each year of construction by up to 1.6-fold (Table 14.6-12). While the effect has a low probability of occurrence, high Cd levels have been linked to adverse effects including increased mortality, decreased growth, and decreased reproductive capacity and success for aquatic plants, algae, invertebrates and fish.

AuRico does not predict effects on fish or fish habitat due to the changes in water quality in Attichika Creek, because the water quality constituents are predicted to remain below the maximum (acute) guidelines.

Waste Rock Creek

The model predicted that seepage from the KUG Project TSF would travel to Waste Rock Creek during all KUG Project phases (Chapter 11 of the Application). Additionally, it is assumed that water from the SeCP is directed to the KUG Project TSF until the end of operations. At closure, water from the SeCP would be allowed to overflow into Waste Rock Creek. During post-closure, KUG Project TSF overflow would discharge via a spillway into a non-fish bearing section of Waste Rock Creek and flow through approximately 1 km of ponds and channels in the upper creek for before entering the section of creek that supports a remnant population of Dolly Varden in Waste Rock Creek. Fish habitat in Waste Rock Creek upstream of the ORAR has been compensated for, and the fish habitat below the ORAR is impounded and naturally constrained by beaver activity, which constrains fish use.

The predicted COPCs for Waste Rock Creek that would exceed the range of natural system variation for both the base case and upper case water quality model scenarios include the following (Tables 14.6-11 and 14.6-12 in the Application):

- total Al in September of the post-closure phase (both model scenarios), April of the closure phase and April of the post-closure phase (base case only), and June of the post-closure phase (upper case only); increased dissolved Al may result in fish asphyxiation and impaired ion regulation. Invertebrates are less sensitive, but the effect may lead to reduced respiratory efficiency;
- total Cu in May of the post-closure phase which may result in decreased fish growth, changes in fish behavior, reduced number of aquatic invertebrate taxa and individuals, and interference with aquatic algae and plants, photosynthesis, respiration, enzyme activity, pigment synthesis and cell division;
- total Se will exceed the range of current conditions in August of the post-closure phase for both the base and upper case model scenarios and was identified as a COPC due to the model conservatism; Se can have multiple negative effects on fish health and reproduction; and

- Nitrate is predicted to exceed the WQG during closure and post-closure, however the levels are within the range of current conditions, and the Application predicts that periphyton and benthic communities would be able to adapt to the changes.

The Application notes that total Cu is primarily identified as a COPC due to model conservatism and concentrations are marginally above WQG for the protection of aquatic life. Identification of total Al, nitrate, and Se as COPCs is directly related to the model conservatism specific to the SeCP (Chapter 11 of the Application). Even with this model conservatism, total Se and nitrate COPCs remained within the range of current conditions in Waste Rock Creek (with the exception of the month of August of the post-closure phase), however, AuRico notes that KUG Project impacts on Waste Rock Creek are limited to increases in flows, which would serve to dilute KS-affected waste-rock seepage (flows from the SeCP) and reduce the influence of Se and NO_2 on aquatic life downstream. Furthermore, there is an ongoing management and monitoring process associated with monitoring the water quality and aquatic health of Waste Rock Creek related to Se and other water quality constituents as part of AuRico's EMA permit requirements for KS.

AuRico predicts that overall, the KUG Project would have a neutral or positive effect on fish and fish habitat in Waste Rock Creek relative to its suitability to support aquatic life.

3.4.1.4 *Mitigation Measures*

The Application proposes the key mitigation measures below to reduce effects to fish and aquatic habitat. Mitigation measures are grouped by potential effect, but many of these mitigation measures would contribute to reducing more than one effect.

<u>Direct Mortality:</u>

- Conduct instream works during the designated FLNRO regional timing window (or fisheries work window) with a qualified environmental professional present to monitor instream works; and
- Continue existing on-site "no fishing" policy from KS.

<u>Habitat Loss:</u>

- Revegetating disturbed areas;
- Retention of roots and groundcover where possible to maintain slope stability and prevent surface erosion;
- Phased removal of vegetation to limit exposure of soils; and
- Progressive reclamation and re-vegetation of decommissioned areas.

<u>Erosion and Sedimentation:</u>

- Wetting work areas and roads;
- Controlling and directing runoff from disturbed areas by grading slopes and ditching;
- Applying appropriate surface drainage techniques (e.g., ditch blocks, ditch surface lining, and rip-rap);
- Stabilizing water diversion channels and ditches and protecting channel banks with rocks, gabions, or fibre mats;
- Installation of silt fences, weed-free straw bales, check dams, fabric-covered triangular dikes, gravel or sand-filled burlap bags, sedimentation ponds and rip-rap along channels and ditches;
- Relevant measures as determined by a Qualified Professional (QP) referred to in the Fish-stream Crossing Guidebook, developed by FLNRO, ENV and DFO; and
- Erosion and sediment control measures.

Changes in Water Quantity:

- Staging discharge of the KS pit water during construction to the natural hydrograph and limiting the discharge period to the six month open water season (estimated as May to October) to mimic natural stream flow and reduce effects from the discharge; and
- Use of non-contact diversion ditches and sediment ponds.

Changes in Water Quality:

- Discharge of effluent from the KUG Project TSF would be managed by use of two stages of water treatment plants, comprising Se ion exchange (Se-IX) treatment and Metals Removal (MR) treatment. Treated water would be regularly monitored to ensure compliance with all applicable discharge requirements;
- PAG waste rock from the underground would be managed by subaqueous deposition in the KUG Project TSF;
- Waste rock from the excavation of the access tunnel will be managed according to ML/ARD potential; and
- Blasting residues will be limited to the East Pit quarry and the underground mine and waste rock generated from mining will be deposited into the KUG Project TSF to reduce nutrient loading to streams.

AuRico also proposes implementation of the following management plans relevant to fish and aquatic habitat (see the EMP section of this report for additional details):

- Mine Waste, Tailings and ML/ARD Management Plan;
- Surface Water Management Plan;
- Fish and Aquatic Effects Monitoring Plan;

- Surface Erosion and Sediment Control Plan;
- Groundwater Monitoring Plan;
- Waste Management Plan;
- Air Quality Management Plan;
- Access Management Plan;
- Environmental Emergency, Spill, and Hazardous Materials Plan; and
- Water Treatment Plan.

3.4.1.5 *Other Relevant Projects*

The Application notes that KS is the only past, present or reasonably foreseeable project with effects on fish and aquatic habitat that could interact cumulatively with those from the KUG Project.

For fish and aquatic habitat, the KS infrastructure and water management strategies are included in the KUG Project site-wide management plans. Therefore KUG Project residual effects already include the influence of KS.

3.4.2 Discussion of Issues

EAO received review comments on the fish and aquatic habitat sections of the Application from ENV, FLNRO and TKN. EAO also facilitated technical discussions on fish and aquatic habitat in relation to water quality with ENV, FLNRO and TKN, and has had one-to-one dialogue with Working Group members to understand key issues in the assessment. The issues tracking tables include all comments received for fish and aquatic habitat related comments, including those that were for clarification and those that relate to subsequent permitting.

Based on a review of the Application and with feedback from the Working Group, the following key issues related to AuRico's assessment of fish and aquatic habitat were identified:

- IDZ in Attichika Creek;
- Fish habitat offsetting for effluent discharge into Attichika Creek; and
- Fish monitoring requirements.

<u>IDZ in Attichika Creek</u>

TKN raised the issue of the IDZ in Attichika Creek and requested that the IDZ be reduced to the greatest extent possible, in order to limit loss of habitat for fish in Attichika Creek. Fish, specifically bull trout, travel through the area of the proposed IDZ and spawn above and below the proposed discharge location. The concern was related

to fish passage through and around the mixing plume, and possible acute and chronic exposure to COPCs.

TKN requested that the IDZ be limited to not more than 100 m, to reduce the effects on fish. TKN proposed that this limitation be included as an EAC condition. The Application does not contain a detailed description of the design of the discharge pipe as this level of detail would be required as part of detailed project design.

EAO notes that the IDZ and discharge into receiving waters is addressed by ENV through permitting under EMA, and that permitting would consider how to constrain the effluent in a way that prevents acute toxicity within the IDZ.

TKN remained concerned that in the absence of a specific limit imposed by the EAC, there was a risk that the IDZ could result in greater effects than that predicted through the EA. To address this uncertainty, EAO proposes conditions requiring AuRico to engage TKN through an Environmental Monitoring Committee to demonstrate how the design of the effluent diffuser has maximized effectiveness using creek flow characteristics to minimize distance of the IDZ, and to monitor the IDZ and ensure fish habitat use is mitigated, as described below.

Fish Habitat Offsetting for Effluent Discharge into Attichika Creek

FLRNO recommended that a fish habitat offsetting plan be developed to address the potential long-term loss of aquatic habitat due to effluent discharge into Attichika Creek. FLNRO noted that the area of aquatic habitat potentially affected by discharge in Attichika Creek downstream of the discharge location is unknown at this time, and thus recommend that an EAC condition be included to ensure offsetting (compensating) for known bull trout spawning areas within the IDZ.

AuRico noted that the IDZ may result in fish avoidance of the area, but not necessarily a loss of habitat, and that the effluent water quality is predicted to meet Metal Mine Effluent Regulation requirements. AuRico is committed to ensuring that the effluent is not acutely lethal at the end of the pipe. Furthermore, bull trout spawning is not known to occur within the immediate vicinity of the pipe in Lower Attichika Creek.

As stated above, EAO notes that the IDZ and discharge into receiving waters is addressed by ENV through the EMA permitting. However given the uncertainty related to the final IDZ and impacts on fish, in order to ensure that no adverse effects to fish or fish habitat occur from the IDZ, EAO recommends an EAC condition requiring AuRico to monitor and mitigate any observed adverse effects of the IDZ on fish habitat use. One of the options for mitigation measures in the plan is offsetting.

EAO also recommends a follow-up program to conduct an assessment to determine if

the KUG Project discharge into Attichika Creek is affecting bull trout spawning sites.

Fish Monitoring Requirements

TKN raised concerns that concentrations of other parameters (i.e. Se and Hg) in other waterbodies (i.e. Attichika Creek) could also be elevated, or may bio-accumulate. TKN noted that the presence of elevated levels of Hg in bull trout in Thutade Lake has created the perception within TKN that fish (or at least bull trout) in Thutade Lake and the surrounding watershed are or may be contaminated. TKN stated the cause of this perceived contamination is often assumed to be mining activity at KS, and the KUG Project is likely to reinforce this perception and, if so, concern exists that TKN members may be discouraged from or less inclined to harvest and consume fish from Thutade Lake and the surrounding area. Therefore, TKN recommended an EAC condition to require monitoring of concentrations of fish tissue in the LSA to confirm or dispel this perception.

While a Fish and Aquatic Effects Monitoring Plan is a requirement of the EMA permit application, EAO notes that the details of that plan would not be developed until permitting and may not specifically address the concern raised by TKN for fish tissue monitoring in Thutade Lake. EAO acknowledges the concern of TKN of potential contamination of fish in the LSA and supports monitoring to track potential parameter exceedances in the environment and inform additional mitigation, if necessary, to ensure no adverse effects to fish. EAO proposes an EAC condition for a Fish and Aquatic Effects Monitoring Plan that would include monitoring of concentrations of bioaccumulative contaminants in bull trout in Thutade Lake, to be developed in consultation with FLNRO, ENV and TKN.

EAO also recommends a follow-up program for fish and aquatic effects monitoring and analysis of bioacummulative contaminants in bull trout in Thutade Lake to verify the predictions of the EA and provide TKN with information on contaminant levels in fish and ensure the protection of the Aboriginal rights title and interests of the TKN First Nations.

3.4.3 Analysis and Conclusions

3.4.3.1 *Characterization of Residual Effects*

EAO identified the following potential residual effects to fish and aquatic habitat from the KUG Project:

- Habitat changes due to increased surface water quantity in Attichika and Waste Rock creeks, and

- Reduced habitat quality from changes to surface water quality in Attichika and Waste Rock creeks.

These effects are discussed above. EAO's residual effects assessment for fish and aquatic habitat is presented in Table 14.

Table 14: Summary of Residual Effects for Fish and Aquatic Habitat

Criteria	Assessment Rating and Rationale
Context	**Quantity:** *Waste Rock Creek* **Low resilience (Fish)**: A small population of Dolly Varden are present in Waste Rock Creek, and have been impacted by past activities of KS, however increases in surface water quantity are expected to be positive for the population. **High resilience (Aquatic Habitat)**: The flow regime at closure and post-closure will resemble the historic regime, and habitat is expected to adapt to the changes. *Attichika Creek* **Moderate resilience (Fish)**: The predicted surface water quantity changes are located downstream from bull trout staging and spawning areas, and therefore must pass through the area of the IDZ to reach spawning grounds. This stream section is used by juvenile bull trout for rearing and has infrequent use by rainbow trout and Dolly Varden adults. **High resilience (Aquatic Habitat)**: Sediment quality and abundance and composition of primary and secondary producers are expected to be similar to baseline conditions. **Quality:** *Waste Rock Creek* **Low resilience (Fish):** A small population of Dolly Varden are present in the bottom section of Waste Rock Creek and abundance of this population is heavily impacted by activities prior to, and including KS. The overall resilience of this Dolly Varden population to further changes in water quality is considered low. **High resilience (Aquatic Habitat):** Changes to water quality as a result of the KUG Project would remain within the current range or are due to the conservative nature of the model, aquatic habitat is

Criteria	Assessment Rating and Rationale
	expected to respond and adapt to these changes. *Attichika Creek* **High resilience (Fish and Aquatic Habitat):** The predicted upper case changes in total Cd are located downstream from core bull trout staging and spawning areas and therefore bull trout must pass through the area of the IDZ to reach spawning grounds. The lower creek is used by rearing bull trout juveniles and infrequent use of the lower creek by rainbow trout and Dolly Varden juveniles and adults. Periphyton and benthic communities and sediments are adaptable to higher concentrations of metals over a short period of time. Furthermore, predicted concentrations of dissolved Cd, were below BC guidelines for the protection of aquatic life in Attichika Creek.
Magnitude	**Quantity:** *Waste Rock Creek* **High**: An increase in flow of 183% is predicted for Waste Rock Creek during closure and 313% during post-closure. Although current quantity rates are very low these changes substantially exceed the current conditions within the creek and more closely resemble the historical flow regime. This change is expected to have a positive effect on the Dolly Varden population. *Attichika Creek* **Low**: The increases to open-water season flows during the pit dewatering campaign would exceed the range of natural variability by a marginal amount (about 5%, for the 90th percentile model outputs), and is not expected to affect the bull trout population. **Quality:** *Waste Rock Creek* **High**: Concentrations of Al and Cu exceed the 95th percentile, concentrations of nitrate are within the range of current conditions, and Se concentrations exceed the 95th percentile during August of post-closure. High concentrations of Al, Cu and Se can have multiple negative effects on fish behaviour, health and reproduction.

Criteria	Assessment Rating and Rationale
	Attichika Creek **Medium to high**: The predicted base case concentrations of total Cd are within the 95th percentile of the current conditions but upper case predictions exceed the current conditions. High Cd levels have been linked to adverse effects including increased mortality, decreased growth, and decreased reproductive capacity and success for aquatic plants, algae, invertebrates and fish. However, Cd is predicted to remain below the maximum (acute) guidelines and therefore not predicted to effect fish or fish habitat.
Extent	**Discrete-Local:** The residual effects are limited to the water bodies within the LSA, in particular lower Attichika Creek and Waste Rock Creek where the KUG Project has direct interaction with the water bodies.
Duration	**Quantity:** *Waste Rock Creek* **Permanent**: Changes to Waste Rock Creek and effects on fish and fish habitat commencing in closure and extending into post-closure continuing after the life of the KUG Project. *Attichika Creek* **Short-term:** Residual effects to water flow in Attichika Creek and resulting effects on fish and fish habitat would occur for four years during construction. **Quality:** *Waste Rock Creek* **Far-future**: Effects on fish and aquatic habitat are predicted to commence in closure and extend into post-closure. *Attichika Creek* **Medium-term**: Effects on fish and aquatic habitat are predicted to be medium-term as the increases in COPCs are predicted for certain years in the construction and operation phases.
Reversibility	**Quantity:** *Waste Rock Creek* **Irreversible**: The changes to surface water quantity in Waste Rock Creek and positive effects to fish and fish habitat would occur during

Criteria	Assessment Rating and Rationale
	closure and post-closure and the effects cannot be reversed. *Attichika Creek* **Reversible**: Effects to fish and fish habitat would cease once the dewatering process is completed and the natural flow regime in Attichika Creek is restored. **Quality:** *Waste Rock Creek* **Irreversible**: Effects to fish and fish habitat from water quality changes in Waste Rock Creek would be permanent during post-closure. *Attichika Creek* **Reversible:** Effects to fish and fish habitat from changes to water quality in Attichika Creek would decrease throughout KUG Project operations.
Frequency	**Quantity:** *Waste Rock Creek* **Continuous**: Effects to fish and fish habitat from changes to water quantity would be continuous during construction and continuous in the post-closure period in Waste Rock Creek. *Attichika Creek* **Regular:** Effects to fish and fish habitat from changes to water flow would be continuous during construction (dewatering) in Attichika Creek from May to October. **Quality:** *Waste Rock Creek* **Regular:** Effects to fish and fish habitat from Al, Cu are predicted for one to three months of the year during closure and post-closure. **Continuous:** Effects to fish and fish habitat from nitrite are predicted for four months of the year during the closure phase and eight months of the year during the post-closure phase. **Continuous** Effects to fish and fish habitat from Se are predicted for most months of the year during both the closure and post-closure phases.

Criteria	Assessment Rating and Rationale
	Attichika Creek **Sporadic**: Effects to fish and fish habitat from guidelines exceedances of Cd are limited to June and October in two years of construction.
Likelihood	**Quantity:** *Waste Rock Creek* **High:** The likelihood of water quantity changes to Waste Rock Creek affecting fish and fish habitat is highly likely in the post-closure phase. Water balance model predictions from the 10^{th} to 90^{th} percentiles include large changes in water quantity in Waste Rock Creek. These changes more closely resemble the historical flow regime and are expected to have a positive effect on the Dolly Varden population. *Attichika Creek* **Low:** The likelihood of changes in surface water quantity to Attichika Creek affecting fish and fish habitat is low during all project phases as surface water quantity changes are within the 5% range of model uncertainty and are not expected to affect the bull trout population. **Quality:** *Waste Rock Creek* **Moderate to High:** Effects to fish and fish habitat from changes to surface water quality are considered to be of moderate to high likelihood due to the breadth of scientific literature available on the negative effects on fish from elevated parameters.. *Attichika Creek* **High:** Effects to fish and fish habitat from changes to surface water quality are considered to be high likelihood due to range of negative effects on fish behaviour, growth and health expected from changes in total and dissolved Al and Cd and total Cu.
Significance Determination	**Quantity – not significant** *Waste Rock Creek* Despite the high magnitude permanent effects, effects are limited to a

Criteria	Assessment Rating and Rationale
	small watershed with a small population of Dolly Varden that is historically impacted by KS activities. Any changes in flow are confined to the Waste Rock Creek watershed and are negligible at the next downstream assessment node (Attichika Creek). EAO also notes that any increases in flow are considered beneficial to the Dolly Varden population; increased water quantity in Waste Rock Creek would make more potential spawning habitat available to Dolly Varden, although it is not certain that this would be used. Considering the above analysis, EAO is satisfied that the KUG Project would not have significant adverse residual water quantity effects on fish and aquatic habitat in Waste Rock Creek. *Attichika Creek* Considering the low magnitude, limited extent, short term duration, reversibility and the proposed condition to stage discharge from the TSF to match the shape of the natural hydrograph, EAO is satisfied that the KUG Project would not have significant adverse residual water quantity effects on fish and aquatic habitat in Attichika Creek. **Quality – not significant** *Waste Rock Creek* Despite the high magnitude, irreversible and far future effects, effects are limited to a small watershed with a small population of Dolly Varden that is historically impacted by KS activities. Any changes in water quality are confined to the Waste Rock Creek watershed and are negligible at the next downstream assessment node (Attichika Creek). EAO also notes that total Cu is primarily identified as a COPC due to model conservatism and identification of aluminium, nitrate and Se as COPCs is directly related to model conservatism specific to the SeCP. While the effect of changes to water quality in Waste Rock Creek is of high magnitude due to exceedances of the guidelines, the predicted levels are within the range of current conditions and not likely to result in further effects to Dolly Varden. Considering the above analysis, EAO is satisfied that the KUG Project would not have significant adverse residual water quality effects on fish and aquatic habitat in Waste Rock Creek.

Criteria	Assessment Rating and Rationale
	Attichika Creek EAO notes the medium to high magnitude, limited extent, short term, reversible and sporadic effects in addition to the fact that the predicted change in total Cd did not occur in base case water quality predictions and is limited to the months of June and October in two years of the Construction phase. Changes to water quality are not predicted to reach the nearest downstream bull trout spawning habitat. EAO is satisfied that the KUG Project would not have significant adverse residual water quality effects on fish and aquatic habitat in Attichika Creek.
Confidence	There is a moderate level of confidence in the fish and aquatic habitat determination based on the water quantity and quality models used in the analysis being reasonably conservative and informed by high quality input data. In addition, there is a robust baseline dataset and pathways of interactions between KUG Project components and effects on fish and aquatic habitat are well understood.

3.4.3.2 *Cumulative Effects*

The former KS is the only past, present or reasonably foreseeable project with effects on fish and fish habitat that could interact cumulatively with those from the KUG Project. As noted above, the impacts from KS are included as part of current conditions for the KUG Project assessments, and therefore the predictions for the KUG Project are cumulative in nature. Therefore no additional quantitative cumulative effects assessment is required for surface water quantity and quality effects on fish and aquatic habitat. The sections below present EAO's review and conclusions of the cumulative effects from KS and the KUG Project on fish and aquatic habitat.

<u>Surface Water Quantity</u>

The predicted residual effects from the KUG Project on fish and fish habitat related to surface water quantity are limited to a change in surface water quantity in Attichika Creek during construction, as well as an increase in water quantity in Waste Rock Creek from construction through post-closure. For both creeks, the baseline includes the impacts from KS as part of current conditions for the KUG Project assessments. EAO notes that the increases to Attichika Creek open-water season flows during the pit

dewatering would exceed the range of natural variability by a marginal amount (about 5%, for the 90th percentile model outputs) and is not expected to effect the bull trout population.

Waste Rock Creek currently experiences reduced flows due to KS. The predicted increase in water quantity to Waste Rock Creek would more closely resemble pre-KS conditions. EAO also notes that any increases in flow are considered beneficial to the Dolly Varden population; increased water quantity in Waste Rock Creek would make more potential spawning habitat available to Dolly Varden, although it is not certain that this would be used.

Surface Water Quality

EAO notes that post-closure of KS there were exceedances of several COPCs in Waste Rock and Attichika creeks (see Table 13 above). Considering the watercourses and COPCs that were impacted from KS (to a level that exceeded WQG), the KUG Project is predicted to cause effects to fish and fish habitat from further impacts to Waste Rock Creek from nitrate, total Cu and total Se and to Attichika Creek from dissolved Al; however, these effects are not considered to be outside of the current range of conditions. Attichika Creek is predicted to have exceedances outside of the 95th percentile of the current conditions only in the upper case model. These exceedances could affect fish health, behaviour and growth.

Considering the above analyses on the significance of the residual effects on fish and aquatic habitat, EAO is of the opinion that the incremental effects from KUG are not significant relative to current conditions and past activities of KS. Therefore, EAO concludes that the cumulative effects to fish and aquatic habitat would be not significant.

3.4.3.3 *Conclusions*

Considering the above analysis and having regard to the conditions identified in the CPD and TOC including the proposed conditions listed below, which would become legally binding in the event that an EAC is issued, EAO is satisfied that the KUG Project would not have significant adverse residual or cumulative effects on fish and aquatic habitat.

EAC conditions relevant to fish and aquatic habitat include:

- Construction EMP, which would include requirements for sediment and erosion control measures;

- the establishment of an Environmental Monitoring Committee that would discuss issue relevant to fish and aquatic habitat including the IDZ and water quality monitoring;
- staged discharge from the KUG Project TSF to a volume proportional to Attichika Creek monthly streamflow and restricted to the open water months in Attichika Creek during construction;
- a requirement to engage with TKN on the design of the diffuser for monitoring and mitigating effects of the IDZ on fish habitat use;
- a requirement for effluent treatment from the KUG Project TSF for metals and Se;
- Fish and Aquatic Effects Monitoring Plan to monitor bioaccumulative contaminants in bull trout in Thutade Lake; and
- A requirement that that discharge to Waste Rock Creek from the KUG Project TSF during post-closure would not incrementally increase Se concentrations in Waste Rock Creek.

3.5 Wildlife

This section summarizes both AuRico's and EAO's assessments of the KUG Project's potential effects on wildlife, the major issues that were raised during the EA and how they were resolved. This section also summarizes the wildlife assessment conducted for potential impacts to wildlife from use of the northern portion of the ORAR, which is the access road into the mine site. The ORAR is an existing road that was built to facilitate access in the region for resource activities. AuRico is the sole permit holder for the northern 168 km of this road, whereas the ORAR below this point down to Mackenzie is shared with other permit holders and users (e.g. forestry sector, First Nations). The northern ORAR was used for KS and was cleared every winter until the mine's closure in 2011. Since this time the ORAR has been maintained during the summer months only by AuRico. If the KUG Project proceeds, the road would be cleared again in the winter and there would be an anticipated 12 trucks per day during operations. The ORAR assessment looks at potential impacts from winter road clearing and road use (traffic), as compared to current conditions.

3.5.1 Background

3.5.1.1 *Description of Valued Components*

Overview

The Application assesses potential impacts to wildlife through an evaluation of effects to the VCs listed in Table 15 below. The Application states that the below VCs were chosen based on consultation with Aboriginal Groups, government agencies and the public. To be included as a wildlife VC, a component needed to: have a potential interaction with the KUG Project; be a requirement of legislation (e.g. listed under the federal SARA), or priority of Aboriginal Groups or stakeholder groups; and have available data and tools to measure effects on the VC (see s. 15.3.1 of the Application for further details on VC selection).

Table 15: Wildlife Valued Components and Conservation Status

VC	Species	Conservation Status BC Conservation Data Centre List[13]. and / or Federal SARA[14]
Woodland caribou	N/A	BC: blue; SARA: special concern (northern mountain population; proposed Thutade herd); threatened (southern mountain population; Chase herd)
Moose	N/A	BC: yellow
Mountain goat	N/A	BC: blue
Grizzly bear	N/A	BC: blue;
Furbearers	American Marten & Wolverine	Wolverine, BC: blue; SARA: special concern
Hoary marmot	N/A	BC: yellow
Bats	Little brown myotis, Long-legged myotis, Western long-eared myotis, Eastern red bat, & Silver-haired bat	Little brown myotis, BC: yellow; SARA: endangered Eastern red bat, BC: red
Raptors	8 species documented during baseline surveys	Short-eared owl, BC: blue; SARA: special concern
Migratory waterbirds	44 species documented from baseline species in RSA and 37 in LSA	Long-tailed duck, BC: blue Horned grebe, BC: yellow; Harlequin duck, BC: yellow
Migratory landbirds	58 species documented from baseline species in RSA and 42 in LSA	Olive-sided flycatcher & Barn swallow, BC: blue; SARA: threatened Rusty blackbird, BC: blue; SARA: special concern; Common nighthawk, BC: yellow; SARA: threatened

[13] BC Conservation data centre list definitions: **Yellow** = Any species or ecosystem that is at the least risk of being lost; **Blue** = Any species or ecosystem that is of special concern; **Red** = Any species or ecosystem that is at risk of being lost (extirpated, endangered or threatened);

[14] SARA definitions: **Special concern** = a wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats; **Threatened** = a wildlife species that is likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction; **Endangered** = a wildlife species that is facing imminent extirpation or extinction

VC	Species	Conservation Status BC Conservation Data Centre List[13]. and / or Federal SARA[14]
Western toad	N/A	BC: blue; SARA: special concern

These species use a range of habitat types at various spatial and temporal scales, and represent other wildlife species that may use similar habitats at similar times. See table 15.3-2 in the Application for a detailed list of the selection rationale for each species or species group.

VC Assessment Indicators

The Application assesses changes in the following indicators to evaluate potential effects on the wildlife VCs:

- Habitat (loss or alteration): direct removal or alteration of wildlife habitat due to the clearing of vegetation.
- Sensory disturbance: KUG Project-related light, noise and human presence.
- Disruption of movement: KUG Project footprint and associated infrastructure that could interrupt wildlife movement.
- Direct mortality: vehicle-wildlife collisions; vegetation clearing during infrastructure construction; and interactions with the transmission line by raptors and migratory birds.
- Indirect mortality: increased hunting pressure and predator access.
- Attractants: features or materials associated with the KUG Project that interest or provide resources to wildlife.
- Chemical hazards: chemicals that have the potential to adversely affect the health of wildlife VCs if taken up from the environment and / or prey and which exceeds tissue effect thresholds.

Caribou

Given the particular interest in caribou that was raised during the EA, this section provides additional background information about this VC.

The woodland caribou in the KUG Project area are not currently designated to a particular herd or local population unit (LPU) for either the northern mountain (i.e., northern ecotype) or southern mountain (i.e., mountain ecotype) populations of caribou. Instead, the caribou in the KUG Project area are located in what is referred to as the southern zone of trace occurrence (ZTO), which has an estimated population of 301

individuals in 2012-2013 and an unknown population trend[15]. The KUG Project area is surrounded by the Chase herd to the south (which is part of the southern mountain population) and the Spatsizi and Frog herds to the north (both of which are part of the northern mountain population; see Figure 10 below). Caribou within the ZTO are part of the northern ecotype, and are blue-listed in BC and federally listed as special concern under SARA. Species that are listed under SARA as special concern are subject to federal management plans, but not recovery plans. Threatened populations under SARA are subject to recovery strategies and plans.

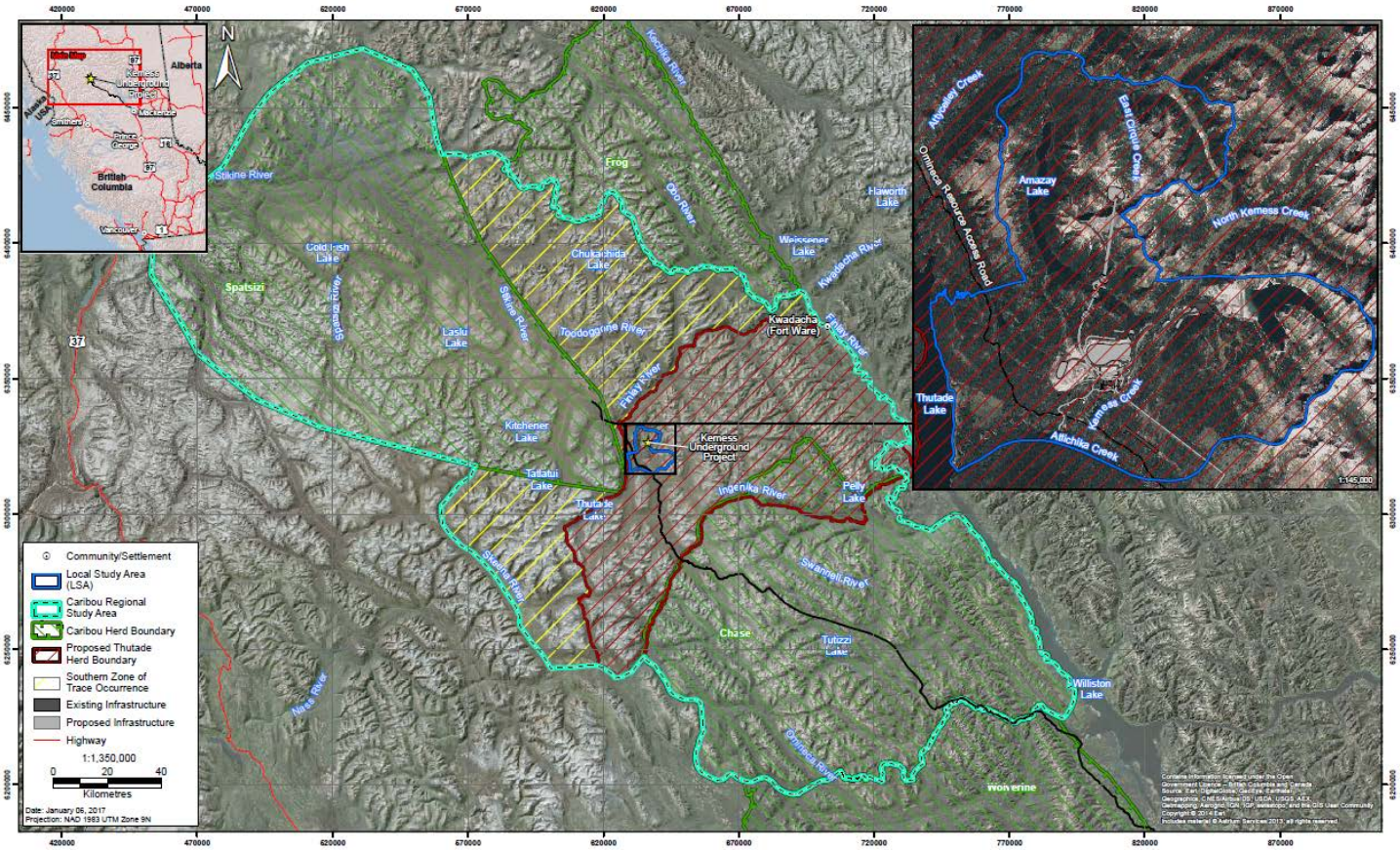
The Chase herd is currently located south of the ZTO (see Figure 10 below) and is part of the southern mountain population, which is provincially blue-listed and federally listed as threatened under SARA. The herd had an estimated population of 475 individuals in 2009 (which was the last survey year) and an unknown population trend. Due to its federal status under SARA, the Chase herd is subject to the 2014 *Recovery Strategy for the Woodland Caribou, Southern Mountain population (Rangifer tarandus caribou) in Canada* (Recovery Strategy).

There is uncertainty regarding population trends for the Chase herd as the latest population estimates are from 2009 and there have been changes to the landscape since that time (e.g. forest fires). Additionally, in 2011 the Committee on the Status of Wildlife in Canada (COSEWIC) proposed to reassign the Chase herd (amongst others) to the northern mountain population. If this recommendation is accepted by the federal government the Recovery Strategy would no longer be applicable to the Chase herd, and it would change the herd's status from threatened to special concern (however the Chase herd will continue to be managed as threatened at least until a decision is made on this recommendation).

As a result of additional data collection, there is a recent proposal for the designation of a new herd called the Thutade herd, which would overlap with the KUG Project area (Sittler, McNay, and Giguere 2015, as cited in s.15.4.3.1 of the Application; see Figure 10 below). The proposed Thutade herd area would be 7,837 km^2 with 102 caribou observed in the area in 2010 and 95 in 2012. The Application and additional information submitted by AuRico during the EA notes that the proposed new herd boundary was delineated in April 2015 through a consensus process that involved provincial wildlife biologists, based on studies that involved AuRico, FLNRO, Environment Canada and First Nations. The most appropriate federal recovery plan for the proposed Thutade herd would be ECCC's 2012 *Management Plan for the Northern Mountain Population of Woodland Caribou (Rangifer tarandus caribou) in Canada.*

[15] The Application notes that areas within the distribution of BC that are not within a specific herd boundary or are of unknown status are considered to be in a ZTO. There is a large ZTO in north-central BC and the KUG Project is located in the southern portion of this ZTO.

Figure 10: Designated Caribou Herds and the Southern Zone of Trace Occurrence

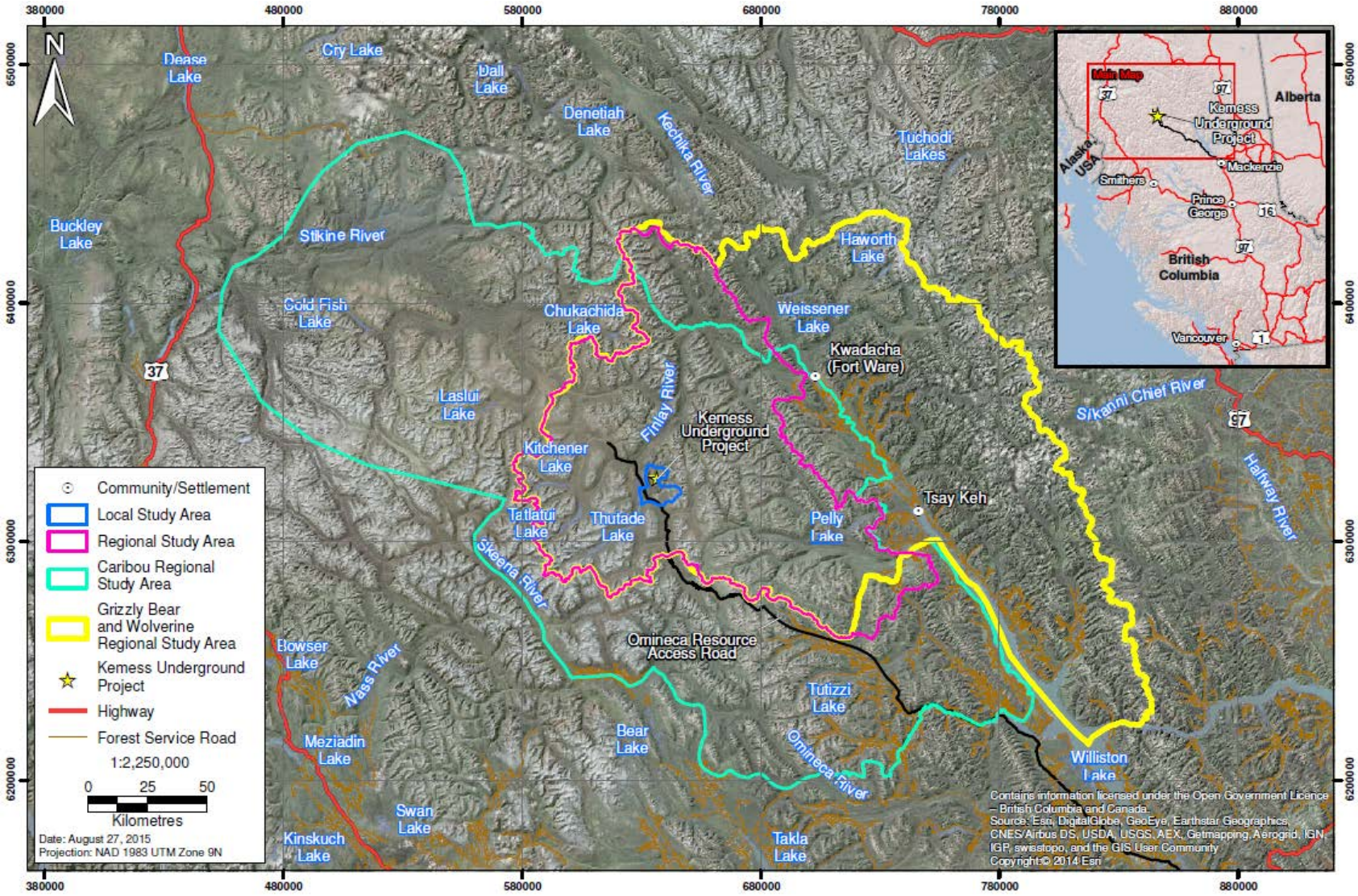


3.5.1.2 *Study Areas*

The LSA for the wildlife VCs is an area in which direct and indirect effects of the KUG Project are most likely to occur for wildlife. It extends from Attichika Creek in the south to Attycelley Creek in the north and Thutade Lake in the west to the height of land at the east end of the KS TSF (see Figure 11 below). The wildlife RSAs are the broader areas representing the maximum limit where potential effects may occur and also represent the cumulative effects study area for each wildlife VC. There is a general wildlife RSA for the majority of species (which is 1,455,428 ha), a grizzly bear RSA based on the boundaries of the Finlay-Ospika Grizzly Bear Population Unit (GBPU, which is 3,077,908 ha) and a caribou RSA based on the neighbouring caribou herd boundaries (Chase and Spatsizi herds, which is 4,273,649 ha; see Figure 11 below). The assessment of potential effects from the ORAR also uses the caribou RSA (Appendix 15-C of the Application).

The ORAR assessment uses the caribou RSA as it includes the boundaries of the Chase caribou herd to the south of the KUG Project area and includes the northern 168 km of the ORAR.

Figure 11: Wildlife LSA and RSAs



3.5.1.3 *AuRico's Assessment*

The following sections provide a summary of the Application's predictions on effects to wildlife VCs. The predicted residual effects are summarized in Table 16 below.

Table 16: Predicted Residual Effects to Wildlife VCs from the Application

VC	Predicted Residual Effect						
	Habitat Loss and Alteration	Sensory Disturbance	Disruption of Movement	Direct Mortality	Indirect Mortality	Attractants	Chemical Hazards
Woodland Caribou	×	×	✓	×	✓ (ORAR)	×	×
Moose	×	×	✓	×	✓ (ORAR)	×	×
Mountain Goat	×	×	×	×	✓ (ORAR)	×	×
Grizzly Bear	×	×	✓	×	×	✓	×
Furbearers: American Marten	×	×	✓	×	×	×	×
Furbearers: Wolverine	×	×	✓	×	×	✓	×
Hoary Marmot	✓	×	×	✓	×	×	×
Bats	×	×	×	×	×	×	×
Raptors	×	×	×	×	×	×	×
Migratory Waterbirds	×	×	×	×	×	×	×
Migratory Landbirds (Olive-sided flycatcher only)	✓	✓	×	×	×	×	×
Western Toad	×	×	✓	×	×	×	×

✓: Application predicts a residual effect
×: Application does not predict a residual effect
ORAR: Impacts predicted from winter clearing of the ORAR only; no indirect mortality predicted from other activities from the KUG Project

<u>Habitat Loss and Alteration</u>

Hoary Marmot: The KUG Project would cause the loss or alternation of approximately 84 ha of high-quality hoary marmot habitat, primarily near the subsidence zone, access road and proposed exhaust ventilation raise (see Figure 15.6-21 of the Application).

This represents 7.4% of high quality hoary marmot habitat in the LSA, and 0.017% in the RSA. There are two marmot colonies near the subsidence zone and four of the twenty dens in the LSA fall within the 250 m buffer of the subsidence zone (although none in the actual zone itself). The Application notes that it is uncertain whether hoary marmot would use this habitat after subsidence (if the slopes of the area are not too severe and some herbs grow then hoary marmot might use the area after subsidence occurs). The Application notes that hoary marmot dens are a special feature of their habitat as they meet the federal definition under SARA of residence (which is a dwelling-place that is occupied by one or more individuals during all or part of their life cycles). Additionally, the Application states that the species is important for TKN for hunting both historically and currently. AuRico identified this as a residual effect due to the potential impacts on dens, and due to the importance of the species to Aboriginal Groups.

Migratory Landbirds / Olive-sided Flycatcher: There were 58 species of migratory landbirds identified during baseline studies including four species of conservation concern (see Table 16 above). These species occupy a diversity of habitats. AuRico predicts that the KUG Project footprint would cause the loss or alteration of 488 ha of migratory landbird habitat, which represents 3% of the suitable habitat in the LSA and 0.026% of the RSA. For migratory birds as a group, the Application states that this is not a residual effect due to the low level of temporary impact, as a % of available habitat in both the LSA and RSA, and because birds could establish other territories. The Application predicts that the KUG Project would cause the loss or alteration of 132 ha (7.6 % of the LSA and 0.087% of the RSA) of high quality olive-sided flycatcher habitat due to clearing in the portal area, Borrow 10 expansion area, access corridor and KUG Project TSF discharge waterline (see Figure 15.6-37 of the Application). AuRico identified this as a residual effect given the species threatened status under SARA and observations of the species in the LSA.

Sensory Disturbance

Migratory Landbirds / Olive-sided Flycatcher: The KUG Project would cause both continuous and instantaneous noise from the construction and operations phases of the project. The Application does not identify sensory disturbance as a residual effect for migratory landbirds as a group, as less than 5% of the LSA (and 0.052% of RSA) would be disturbed due to noise. However, the Application predicts effects from noise would be up to 7.8% disturbance of suitable habitat for the olive-sided flycatcher (due to instantaneous traffic noise during operations; lower amounts would be disturbed due to general project noise and blasting; see Figure 15.6-39 in the Application). AuRico identified this as a residual effect due to its status under SARA and observations of the species within the LSA.

Disruption of Movement

The KUG Project would involve several new linear project features in the lower elevation areas of the site: the proposed access corridor in the north (which includes an all-season road, transmission line and overland conveyor system running adjacent to one another); and water discharge line in the south. While roads may have an effect on movement to some wildlife, the Application notes that the conveyor system and water pipelines are more likely to create impediments to wildlife movement. The access corridor would amount to 4.3 km of new development. 1.2 km of the conveyor in the access corridor would be raised by about 15 cm off the ground and would be through forested habitat (which would present the greatest barrier to movement). The conveyor going over the saddle area of the KUG Project site would be raised by up to 8 m. The remaining length of the access corridor would be on previously disturbed areas next to the KS pit and via a tunnel through a mountain ridge). There is evidence of caribou use of the lower elevation areas where the new linear components would occur. It is currently unknown if moose, wolverine and American marten would move through the area where the conveyor is proposed (although moose have been observed in the drainages to the east and west of the proposed access corridor). AuRico identified a residual effect on disruption to movement of woodland caribou, moose, grizzly bear and wolverine as a result of all of the proposed new linear components (i.e. access corridor and water discharge line).

The Attycelley and Attichika drainages (which are located above and below the KUG Project infrastructure) are likely seasonal migration corridors for moose, possibly connected by Thutade Lake to the west of the KUG Project and Kemess Lake Valley to the east of the access corridor. While no new linear infrastructure would be built that creates a complete barrier in Kemess Lake Valley (the conveyor would be raised up to 8 m to allow wildlife to pass underneath), the increased use of existing roads and infrastructure in this valley might cause additional effects on moose movement.
The Application predicts that movement of American marten and western toad would be adversely impacted by the water discharge line only. For American marten, the width of the access road in the access corridor connecting the KS infrastructure and underground mine area would be smaller than the threshold that current literature predicts would create an impact to movement for American marten. For western toad, the wetlands near the discharge line are potential breeding habitat for the species. As noted above, the Application predicts that the discharge line, which would be 1 m diameter or less and lie flush to the ground, would be a barrier to western toad movement.

Direct Mortality

Hoary Marmot: The KUG Project might cause direct mortality to hoary marmots due to impacts in the subsidence zone, and from vehicles on the access roads near the subsidence zone and exhaust ventilation raise. As noted previously, surveys found marmot colonies and dens within the area around the subsidence zone. Direct mortality could occur if the subsidence zone is greater than expected and it impacts some of the surrounding colonies or if their dens are in the area that subsidence occurs. The Application notes that no dens have currently been identified directly in the subsidence zone; however AuRico identified this as a residual effect. AuRico does not predict that there would be a residual effect from direct mortality due to vehicle collisions as hoary marmots have small home ranges (13.5 ha), are quite sedentary and vehicles would be travelling at slow speeds along the roads near the subsidence zone.

Indirect Mortality

Caribou, moose and mountain goat (ORAR): The Application predicts that there would be residual effects from indirect mortality to caribou (Chase herd only; negligible residual effects to Wolverine herd), moose and mountain goat from clearing snow along the northern 168 km of the ORAR during the winter. This would be due to increased recreational activity along the ORAR, such as snowmobiling, that might create new access off of the ORAR in areas in proximity to caribou, moose and mountain goat habitat (see Figure 5.1-1 of Appendix 15-C of the Application for alpine habitat and ungulate winter ranges in proximity to ORAR). The Application states that snowmobile trails could facilitate the movement of predators (e.g., wolves) into previously inaccessible areas and increase predation on caribou, moose and mountain goat. During Application review, AuRico learned that restrictions apply in several wildlife management units (WMU) either near the ORAR or in the current Chase herd LPU that prohibit snowmobile and ATV use for the purposes of hunting, but not for other uses such as recreational snowmobilers. The goal of these restrictions is to limit hunter access via snowmobiles and ATVs to provide fair opportunity to hunters and fair chase for wildlife. For the WMUs with snowmobile restrictions, they are only from March 31 to November 30, whereas the restrictions on ATVs are year round.

Attractants

Grizzly bears: At the KUG Project site, Grizzly bears might be attracted to camp odours (e.g. from the kitchen), roadside vegetation, vehicle-killed wildlife carcasses and waste during construction and operation. As grizzly bears may use the roads as travel routes, the attractants could increase the risk of bear-vehicle interactions and human-bear conflicts.

Wolverine: Wolverines show similar sensitivities to development as grizzly bears, including the potential to be attracted by human waste or other camp conditions. Accordingly, as there are predicted residual effects to grizzly bears from attractants, there are similar predicted effects for wolverine.

Mitigation Measures

The Application proposes a variety of mitigation measures to address potential impacts to wildlife. This section presents some of the key mitigations that EAO has noted. A complete list of avoidance, mitigation and restoration measures can be found in the Application, Section 15.5.3.

AuRico addressed a number of potential wildlife effects through project design including:

- Design of KUG Project as underground mine minimizes the surface disturbance and potential negative effects on wildlife;
- Use of existing KS facilities (e.g. airstrip and open pit), thereby reducing new surface disturbance;
- Siting of the road corridor and portal area (in consultation with TKN) in part to avoid impacts to terrestrial ecosystems in the Amazay Lake watershed and North Kemess Creek Valley; and
- Conveyor elevated ~15 cm in the access corridor to facilitate movement of small animals beneath it (e.g. American marten and fisher); and up to 8 m in the saddle area to permit large wildlife to pass under it.

AuRico also identified the following key mitigation measures:

- Crossing structures over the KUG Project TSF discharge water line: gravel poured over water discharge pipe at regular intervals to facilitate wildlife crossing and mitigate disruption to movement;
- Managing snowbank height on KUG Project roads and creating escape pathways (i.e., gaps) in snowbanks to allow wildlife (e.g., moose) to exit the road area;
- Creating and maintaining road culverts to facilitate wildlife movement/habitat connectivity;
- Applying speed limit restrictions on traffic along the Kemess access road and the proposed discharge line road that bisect potential movement corridors;
- Undertaking reclamation activities designed to remove barriers and accommodate wildlife movement following mine closure;
- Prohibiting hunting and trapping by employees;
- Removing carrion from KUG Project roads;

- Minimizing snowmobile access along the ORAR (focusing on areas in proximity to key caribou, moose and mountain goat habitat (see Figure 5.1-1 of appendix 15-C of the Application) in order to reduce impacts from indirect mortality through measures such as the following:
    - having narrower pull outs to make it difficult for trucks with snowmobile trailers to turn around;
    - avoiding creating large areas that snowmobilers could use as parking and discourage parking at pull out locations by posting signs;
    - creating steep snowbanks to make it more difficult tor snowmobile access in areas near proposed or existing ungulate winter ranges;
    - monitoring incidental recreation use along the northern portion of the ORAR; and
- Mitigation measures related to lighting: Directed / focused lighting where possible rather than broad area lighting; lighting in non-essential areas only used when necessary; lights will be shielded where practical to minimize stray light.

Proposed EMPs that are relevant to wildlife include:

- Wildlife Management and Monitoring Plan, with the following objectives (see Table 24.19-1 and 24.19-2 in the Application for species specific mitigation measures proposed in the plan):
    - Minimize the risk of wildlife mortality (e.g. measures to reduce wildlife-vehicle interactions; and reporting wildlife-vehicle and human-wildlife interactions and compiling records to help identify locations with high levels of wildlife conflicts and identify potential opportunities for adaptive management; conduct pre-clearing surveys); and
    - Minimize the potential for human-wildlife interactions.
- ORAR Wildlife Monitoring Program: wildlife occurrence and mortality will be reported; information may then be used as part of an adaptive management plan to further mitigate conflicts between wildlife and road users.
- Human Bear Conflict Prevention Plan (pre-existing from KS).
- Subsidence Effects and Terrain Monitoring Plan: monitor potential effect of subsidence.
- Noise Management Plan: ensure noise levels are acceptable for human and wildlife receptors.
- Waste Management Plan (including exclusion fencing, proper storage of attractants, on-site education): to reduce the impact of attractants to species such as grizzly bear and wolverine.

- Environmental Emergency, Spill and Hazardous Materials Plan: to mitigate potential effects of chemical hazards by ensuring their safe storage and transport.

3.5.1.4 *Other Relevant Projects*

The other activities in the region that could interact cumulatively with the above noted predicted residual effects on wildlife are mines and mineral exploration, forestry, roads and transmission lines. The Application conducts a cumulative effects assessment on the interaction between the KUG Project and the following other activities:

- Mines:
    - KS: copper /gold open pit mine; operated from 1988 to 2011; immediately adjacent to the KUG Project; reclaimed except for infrastructure that would be used in the KUG Project,
    - Baker & Shasta: open pit/underground gold mines mined seasonally since the 1980s and in care and maintenance since November 2012; located 33 km and 26 km respectively from KUG Project; and
    - Lawyers: underground gold/silver mine in operation from 1989 to 1992; 40 km from KUG Project; reclamation completed in September 1998;
- Mineral Exploration: Brenda, JD;
- Forestry: 1980 to 2009; and
- Linear features in the region: transmission Lines and roads for the whole RSA (including those associated with the above noted relevant projects).

3.5.2 Discussion of Issues

EAO received review comments on the wildlife sections of the Application from FLNRO-Ecosystems, Canadian Wildlife Service (CWS; part of ECCC) and TKN.

Below, EAO has summarized the key EA issues that required resolution as part of the Application review phase. The issues tracking tables include all comments received for wildlife related comments, including those that were for clarification.

Based on a review of the Application and with feedback from the Working Group, the following key issues related to AuRico's assessment of wildlife were identified:

- Inadequate baseline data for several wildlife species;
- Lack of verification of habitat suitability models;
- Unclear threshold for "residual" effects from habitat loss and alteration;

- Potential impacts to caribou; and
- Additional wildlife mitigation measures to reduce potential effects.

Baseline Data & Assessment of Birds, Bats and Western Toad

CWS and TKN raised concerns about inadequate baseline data for birds, bats and western toad. The Application does not contain the level of baseline survey data for these groups that is recommended by CWS. For example, there is little consideration in the baseline data for inter-annual habitat variation for migratory landbirds or bats; no bird survey information for much of the southern portion of the study area (the wetland area); no baseline information for bat roosts and no surveys conducted for western toad in the northeastern portions of Kemess Creek between Kemess Lake and the KS TSF (where a juvenile toad was found, which could suggest nearby breeding habitat). An uncertain baseline creates uncertainty in the effects assessments of birds, bats and western toad. For example, without robust baseline information, there is the risk of missing important information for species at risk and there is little knowledge of species density in the KUG Project area (which could indicate biodiversity or distribution "hot spots"). Additionally, poor survey data creates challenges for creating appropriate mitigation measures, and designing effective monitoring of impacts to birds and bats during and after the KUG Project as there is an uncertain baseline from which to monitor potential changes.

Birds

In addition to requesting additional survey information, CWS recommended that SARA-listed species effects assessments be conducted for Common Nighthawks (SARA: Threatened), Barn Swallows (COSEWIC: Threatened), Short-eared Owls (SARA: Special Concern), and Rusty Blackbirds (SARA: Special Concern) to determine potential effects of the KUG Project and guide any management and mitigation plans that should be developed to address these.

As part of the approach to addressing concerns about uncertainties from low baseline data for birds, AuRico estimated bird species densities with bounds of confidence for species identified during point counts for the KUG Project (alpine, forest and woodpecker migratory birds and terrestrial listed species) using existing point count data, the breeding bird atlas data and available literature based on similar northern central BC habitat.

The results of this analysis showed the percentage of species at risk birds in the LSA potentially affected by the KUG Project using density estimates as the following:

- Rusty blackbird: 0.7 – 12.8% (0-1 birds)

- Barn swallow: 0.6 – 9% (7-26 birds)
- Olive-sided flycatcher: 4.2 - 13.7% (3-11 birds)
- Short-eared owl: 2% (3 birds)
- Common nighthawk: no common nighthawks were detected within the biogeoclimatic zones found within the LSA
- Terrestrial migratory birds (total): 1.7-5%
- Wetland migratory birds (total): 0.9-9.9%

AuRico notes that these calculations support the estimates of potential impacts using the suitable habitat models in the Application for olive-sided flycatcher (7.6% of LSA), short-eared owl (2.5 % of LSA) and terrestrial migratory birds overall (2.9% of LSA; see Table 17 below).

ECCC reviewed the additional work done by AuRico and noted that point count surveys alone are not sufficient to confirm evidence of nesting, and thus additional survey methods should be integrated into mitigation and management strategies. ECCC recommended that clearing not occur during sensitive periods for migratory birds, with or without surveys to determine potentially active nest sites. They stated that in most habitats, the ability to detect nests remains very low while the risk of disturbing active nests is high. ECCC noted that construction during the nesting period for migratory birds carries with it high risks of detrimental effects (incidental take) to migratory birds. Proponents should be aware of the risks and take appropriate action to ensure they are in compliance with the *Migratory Bird Convention Act*. ECCC recommended that, before any clearing occurs, and in order to determine presence of migratory birds, AuRico create a scientifically sound approach in the Wildlife Management and Monitoring Plan that includes:

- a list of existing standards to be followed during the KUG Project, including RISC standards for inventory and survey methods of Forest and Grassland Birds (including recommendations for survey frequency and timing), as well as other species-specific survey and inventory methods accepted by ECCC where applicable for species that are often not detected using Resources Information Standards Committee (RISC) guidelines (e.g. Common Nighthawk, Short-eared Owl, etc.); and
- descriptions of how surveys will be carried out by an experienced, QP in a manner that protects migratory birds and nests and avoids harming, killing or disturbing migratory birds or destroying or taking their nests or eggs.

In response to CWS' request for species specific assessments for certain bird and owl species, AuRico reviewed the federal recovery and management plans for these species to identify threats listed in the documents and identify management and population objectives. AuRico then considered these with respect to the KUG Project.

AuRico found that mining was only identified as a threat in the relevant plans for olive-sided flycatcher and short-eared owl. The Application predicted impacts from habitat loss and alteration for both of these species (see Table 18 below).

ECCC noted that in the absence of additional species-specific effects assessments, ECCC accepted AuRico's density estimates and percentages of birds potentially affected in the LSA. ECCC requested that AuRico commit to mitigation measures in the Wildlife Management and Monitoring Plan to reduce potential effects of increased traffic on the ORAR and other roads associated with the KUG Project, especially for common nighthawk and short-eared owl (both of which ECCC noted have roads as identified threats to recovery/management). ECCC recommended that AuRico use adaptive management strategies if effects to migratory landbirds were predicted to occur in the future or if the KUG Project would impact the achievement of federal management and population objectives for olive-sided flycatcher and short-eared owl or other SARA-listed species potentially affected by the KUG Project.

In response to the issue of gaps in bird baseline data, TKN proposed a condition requiring monitoring surveys in areas of the LSA where data limitations exist for terrestrial birds to determine presence and relative abundance. CWS recommended that barn swallows be explicitly included in the Wildlife Management and Monitoring Plan with a species-specific strategy for monitoring and mitigating potential effects to this species. For barn swallows, CWS recommended that nest surveys of infrastructure be conducted bi-weekly (at a minimum) to maximize opportunities for adaptive management if active nests are found, in addition to proposed pre-clearing point count surveys.

EAO agrees that these mitigation and monitoring measures would help to reduce and adaptively manage potential impacts to migratory birds and proposes the following measures related to migratory birds as part of the proposed EAC Wildlife Management and Monitoring Plan condition, which include adaptive management developed in consultation with TKN and relevant government agencies:

- Pre-clearing surveys of raptors, and migratory birds by a QP;
- A scientifically sound approach for monitoring that includes:

    i) A list of existing standards to be followed during the KUG Project, including RISC standards for inventory and survey methods of Forest and Grassland Birds (including recommendations for survey frequency and timing), as well as other species-specific survey and inventory methods accepted by ECCC where applicable for species that are often not detected using RISC guidelines (e.g. Short-eared Owl, etc.);
    ii) Descriptions of how surveys will be carried out by a QP in a manner that protects and avoids harming, killing or disturbing migratory birds or

destroying or taking their nests or eggs, following advice from ECCC's Avoidance Guidelines (http://www.ec.gc.ca/paom-itmb/) and in consultation with regional ECCC;

- Protection of active nest sites by species specific buffers using guidance from General Nesting Periods of Migratory Birds in Canada, ECCC 2016, with a minimum 30 m buffer if evidence of nesting is observed and avoiding clearing outside of the reduced risk window as identified in the Region 7 Omineca – Reduced Risk Windows for Fish and Wildlife (Ministry of Water, Land and Air Protection 2004;) is not possible;
- Bi-weekly nest surveys of infrastructure potentially used by barn swallows for nesting, during the breeding season. A species-specific buffer will be employed around all probable or actual nest sites that are detected during pre-clearing point count surveys or on infrastructure. These nests will be monitored until the young have fledged or the nest is abandoned. The minimum buffer distance of 30 meters must be utilized wherever practicable as determined by a QP; and
- Requirement to record the exact buffer distance employed for any nest sites and report the outcome of the nesting attempt in annual reporting.

EAO also recommends a federal follow-up program to monitor migratory birds and SARA-listed bird species to determine bird presence, behaviour and nesting.

Bats

In light of TKN's concerns regarding the level of baseline data collection for bats, TKN recommended a condition that the Wildlife Management and Monitoring Plan be aligned with management and monitoring provisions identified in the Best Management Practices for Bats in BC (ENV 2016). Specifically TKN recommended that AuRico must complete pre-clearing surveys to identify structural stage 6 or 7 trees that could be used as roosting habitat or hibernacula and offset the potential loss of observed roosting habitat by installation of bat boxes or artificial roost trees in suitable locations. They noted this should consider the location and design to accommodate the various species identified onsite according to the BC Community Bat Program. They recommended monitoring of the bat activity onsite should include determination of the level of occupancy, use and maintenance of structures.

Additionally, CWS recommended developing and implementing additional project-specific measures to avoid and lessen any adverse effects on species at risk individuals, residences, including hibernacula, and other important habitats. Where maternity sites or hibernacula have been identified, CWS recommended identifying, implementing and monitoring appropriate buffers to protect bat species at risk maternity roosting sites and hibernacula throughout all phases of the KUG Project.

AuRico committed to completing pre-clearing surveys to identify mature and old trees

that could be used as roosting habitat or hibernacula and offset the potential loss of observed roosting habitat by installation of bat boxes in a suitable location.

CWS acknowledged AuRico's response and commitment to avoiding potential bat roosting habitat and hibernacula. Due to uncertainty around box value and documented low occupancy rates, CWS discouraged AuRico from relying solely on bat boxes to offset any potential loss and encouraged consideration of other alternatives including artificial roost trees that simulate trees with loose bark (BC ENV 2016) and other appropriate accepted measures. Additionally, due to inter-annual variation in the use of habitat features by bats and initial detections of Little Brown and Northern Myotis in KUG Project baseline surveys, ECCC recommended that additional pre-construction surveys for bats be conducted in the LSA using currently accepted best management practices and survey methods as a condition of the EAC.

EAO agrees that the above noted measures would help to reduce and adaptively manage potential impacts to bats and proposes inclusion of mitigation, management and monitoring practices for bats, including those in BC ENV 2016, in an EAC condition as part of the Wildlife Management and Monitoring Plan, which would be developed in consultation with TKN and relevant government agencies. This plan would require pre-clearing surveys for bats by a QP to determine the distribution of bat roosting habitat and offsets for the potential loss of observed bat roosting habitat by installation of bat boxes or artificial roost trees.

Western Toad

In the absence of sufficient baseline data for western toad, CWS requested that AuRico provide density and abundance estimates using existing baseline data throughout the LSA, in order to assess potential effects and plan for future monitoring and mitigation efforts on site. AuRico provided information on density and abundance in the LSA as well as search effort by year. AuRico concluded by noting that western toad abundance and density was very low for all years and areas searched with only five individuals recorded in 2014 (no individuals were recorded for annual searches in 2004-2007 or in 2009).

CWS found AuRico’s response to be satisfactory in terms of quantifying search effort.

CWS recommended that western toad mitigation measures included the protection of migration corridors and other important life stage habitat and pointed to document “ECCC 2016. Environmental Assessment Standard Guidance for the Western Toad. Environment and Climate Change Canada/Canadian Wildlife Service” for guidance on mitigation measures” (ECCC 2016).

In response to CWS’ concerns, AuRico committed to implementing no-disturbance

buffers surrounding any identified breeding habitats for western toads found during pre-construction surveys using guidance provided in ECCC (2016). Buffers would include the maximum distance recommended in ECCC (2016) to ensure protection of habitat that encompasses a large amount of western toad movement in terrestrial habitats surrounding aquatic breeding areas.

EAO agrees that the above noted measures would help to reduce and adaptively manage potential impacts to western toads and proposes inclusion of these measures in addition to pre-clearing surveys of western toads by a QP in an EAC condition as part of the Wildlife Management and Monitoring Plan, which would be developed in consultation with TKN and relevant government agencies.

Verification of Habitat Suitability Models

The Application uses habitat suitability models to predict impacts on habitat loss and alteration for the wildlife VCs. TKN and FLNRO raised the issue that these suitability models have not been verified in the field (i.e. they have not been "ground-truthed") to understand the degree to which they accurately represent species' habitats. They noted that this could create uncertainty in the effects assessments on impacts to habitat.

In order to provide some bounds to this uncertainty, and increase confidence in the reliability of the models AuRico quantified the reliability of each habitat suitability map by comparing it with data on animal observations (and animal observations and sign for hoary marmot, and sign only for American marten). AuRico calculated the percentage of animals that corresponded with high quality or low quality habitat for woodland caribou, moose, mountain goat, grizzly bear, American marten and hoary marmot by season. The results varied by species with a generally high level of consistency between animal observations and the suitability model for moose, mountain goat, American marten and hoary marmot, and lower consistency between the two for caribou and grizzly bears (see Table 17 below).

Table 17: Percentage of Animal Observations Associated with Habitat Suitability Modelling High Quality and Low Quality Habitat[16]

VC	Season	% Animal Observations in High Quality Habitat	% Animal Observations in Lower Quality Habitat
Woodland caribou	Early Winter	0	100
	Late Winter	8	92

[16] Reproduced from memo "20161020_KUG Comments_FLNRO 024.1_habitat suitability_Memo".

VC	Season	% Animal Observations in High Quality Habitat	% Animal Observations in Lower Quality Habitat
	Spring / Calving	55	45
	Summer	45	44
Moose	Early Winter	-	-
	Late Winter	100	0
Mountain Goat	Winter	86	14
	Summer	95	5
Grizzly Bear	Spring	50	50
	Summer	-	-
	Fall	0	100
American marten	Winter	68	32
Hoary marmot	Growing	64	36

Concerning grizzly bears, AuRico noted that there was very little high quality fall habitat modelled in the LSA and there was only a single location where a bear was observed during this period. Additionally, due to their large home ranges, AuRico stated that bears will often be observed moving through matrix habitat as they travel between patches of high quality foraging habitat. For caribou, AuRico explained that there was little high quality early winter habitat modelled and observations were associated with moderate habitat. Additionally, AuRico noted that the caribou in the LSA tended to use low elevation areas during the late winter as few of the high elevation areas are snow blown and high snow levels at lower elevations preclude the caribou from accessing the high elevation areas.

TKN reviewed the analysis and responded that they did not request any further action.

In consideration of AuRico's analysis which shows a reasonable association between animal observations and its habitat suitability models, and its explanations for the lower consistency shown for grizzly bear and caribou, EAO concludes that this issue has been adequately addressed. Additionally, EAO is proposing a Wildlife Management and Monitoring Plan as an EAC condition, which include the requirement to record wildlife observations, which would increase the understanding of habitat use in the KUG Project area. Additionally, the caribou management and monitoring plan must be informed by data in Sittler et al (2015), which would provide additional information on caribou seasonal habitat potentially impacted by the KUG Project.

Residual Effects to Habitat Loss

Residual Effects Threshold

The wildlife sub-working group expressed confusion regarding what "threshold" or rationale the Application used to consider an effect "residual" for habitat loss and alteration. EAO notes that the Application predicts habitat loss and alteration for all wildlife VCs, as outlined in Table 18 below. However, the Application only brings forward habitat impacts to olive-sided flycatcher and hoary marmot into a residual effects evaluation. One of the concerns with not considering all habitat effects that exist after mitigation as "residual" is that no cumulative effects assessment is conducted for these VCs. The KUG Project would have a relatively small direct footprint; however there is a concern that it might act cumulatively with impacts from the past operating KS, and other resource activities in the region, on certain wildlife species.

Table 18: Wildlife Valued Component Habitat Lost or Altered due to the KUG Project

VC	Total High Quality Habitat Lost and Altered (Based on seasonal habitat amounts where noted)			Season
	Area (ha)	% LSA	%RSA	
Woodland caribou	42	18.2	0.071	Early winter
	101.6	3.5	0.007	Seasons combined
Moose	97	2.0	0.015	Seasons combined
Mountain goat	72	3.0	0.004	Winter
Grizzly bear	49	2.3	0.008	Seasons combined
Furbearers (American marten)[17]	318	4.6	0.053	Winter
Hoary marmot	84	7.4	0.017	Growing
Bats	300	4.6	0.053	Roosting
Western toad	11	4.2	0.048	N/A
Raptors:				
• Northern goshawk	33	1.9	0.022	N/A
• Short-eared owl	26	2.5	0.029	N/A
Migratory waterbirds:				
• Wetland birds	40	1.9	0.022	N/A

[17] Habitat suitability modelling in the Application was conducted for American marten only. Habitat loss and alteration for wolverine was considered by looking at the predictions for moose, mountain goat, and hoary marmot (wolverine prey species).

VC	Total High Quality Habitat Lost and Altered (Based on seasonal habitat amounts where noted)			Season
• Cavity-nesting waterfowl	298	3.3	0.034	N/A
• Riverine birds*	0.5	1.1	N/A	N/A
Migratory landbirds:				
• Migratory landbirds	488	2.9	0.026	N/A
• Olive-sided flycatcher	132	7.6	0.087	N/A

*Area of lost or altered habitat is length of stream (km) instead of area

In response, AuRico explained that potential effects to habitat loss and alteration, as well as sensory disturbance were brought forward as residual effects for all wildlife species except for caribou if the predicted impact was greater than a 5% change to the LSA. Impacts less than this amount were not considered residual effects because at the scale of the RSA these impacts would amount to changes of less than 1%. For caribou, the Application predicted that there would be loss of early winter habitat amounting to around 18% of the LSA (see Table 18 above). AuRico explained that this was not considered a residual effect because early winter habitat would only be affected along the water discharge line, the majority of which would parallel an existing road so there would be negligible additional habitat loss or alteration.

As per EAO's 2013 "Guideline for the Selection of Valued Components and Assessment of Potential Effects", EAO considers a residual effect to be the following:

> *"… those effects remaining after the implementation of all mitigation measures, and, therefore are the expected consequences of the reviewable project for the selected VCs."*

Applying this definition to the KUG Project, EAO views all of the predicted impacts to habitat loss and alteration outlined in Table 18 above to be residual effects. Accordingly, EAO has brought forward all of these effects into the residual and cumulative effects characterizations in the "Analysis and Conclusions" section below.

Residual Effects Calculations

TKN raised the issue that the Application does not provide a combined prediction of the effects to habitat from loss or alteration, and functional loss through disturbance (e.g. noise) and notes that this is particularly relevant for caribou. TKN noted that this may underestimate the amount of overall habitat that is impacted by the KUG Project.

AuRico conducted this assessment for caribou using updated mapping provided by CWS (see the caribou section below), but noted that it was not a requirement of the AIR issued by EAO. Issues related to potential impacts on caribou, including Working Group discussion, are summarized in the caribou section below.

TKN also expressed concerns that the wildlife habitat loss and alteration assessments did not include year-round suitable and potentially impacted habitat for species using the KUG Project area year round (i.e., moose and furbearers).

AuRico conducted this analysis for caribou (based on the habitat suitability model in the Application) and predicts that a total of 101.6 ha out of a total of 2,919 ha of high quality habitat combined for all seasons in the LSA would be lost or altered due to the KUG Project. This represents 3.5% of high quality habitat combined for all seasons in the LSA and 0.007% of the RSA.

Regarding moose and furbearers, AuRico noted that the habitat suitability models used in the Application were based on winter habitat because this is the season when effects to marten and moose would be of the most concern. Additionally, AuRico explained that the winter models created have many of the same attributes as other seasons and that marten and moose are expected to use a broad range of habitats in seasons other than winter. Accordingly, AuRico expects that potential effects during the snow-free periods would be similar or less to that evaluated for the winter season.

In response to the above information from AuRico, TKN noted that TKN participation in the development and implementation of management and monitoring plans should be considered. As noted previously, EAO is proposing a Wildlife Management and Monitoring Plan as an EAC condition that would be developed in consultation with TKN and relevant government agencies.

Caribou

CWS, FLNRO and TKN raised a variety of concerns related to AuRico's caribou effects assessment methodology and predictions (see the Working Group and TKN issues tracking tables for all of their concerns). One of the primary caribou issues in the EA was the potential effects of the KUG Project on critical habitat (CH) for the Chase herd. In 2016, CWS provided updated mapping of CH for the Chase herd which had been identified within the 2014 Southern Mountain Caribou recovery strategy. The 2016 draft mapping of CH within the 2014 Chase LPU boundary flanks most of the ORAR where AuRico is the sole permit holder. As well, the 2016 mapping included candidate CH north of the 2014 LPU boundary (extending into the proposed Chase Recovery Planning Area (RPA; McNay et. al, 2008)) which overlaps with the KUG Project mine site. The Chase herd 2014 CH was considered in the assessment of potential impacts

from the ORAR in the Application and subsequent memos from AuRico as much of this CH has been incorporated into provincially designated ungulate winter ranges (see Appendix 15-C of the Application; and "20160706_B.1 - KUG Comment FLNRO-016, FLNRO-017, FLNRO-018, FLNRO-127, FLNRO-128, FLNRO-134_UWR_Memo").

The goal for the Recovery Strategy is "to achieve self-sustaining populations in all LPUs within their current distribution". In order to achieve this goal the Recovery Strategy defines CH and includes the following disturbance limits:

> *"*This strategy considers at this time that very minimal disturbance for high-elevation winter and/or summer ranges in all Groups, and at least a 65% undisturbed habitat level for low elevation winter ranges in the Northern and Central Groups, are required for achieving recovery of LPUs*."* (S. 7.1 Identification of CH for Southern Mountain Caribou, Recovery Strategy)

Throughout Application review caribou working group members (CWS, FLNRO, TKN, ENV and EAO) exchanged information regarding what herd the caribou at the mine site belonged to (i.e. Chase or Thutade). At EAO's November 25, 2016 caribou sub-working group meeting, Krista Sittler, a wildlife biologist who works for Wildlife Infometrics, presented her team's research on the delineation of the proposed Thutade herd caribou in the KUG Project mine site area. After reviewing the best available information, including the Sittler et al (2015) research, CWS concurred that the KUG Project mine site is located within the proposed Thutade herd (considered Northern Mountain Caribou), not the Chase herd (listed in SARA as Southern Mountain Caribou). This is consistent with the current provincial view communicated by ENV.

CWS requested that AuRico conduct a variety of additional analyses regarding potential impacts to caribou both at the mine site and from use and winter clearing of the ORAR, including the below requests. A summary of key aspects of AuRico's responses and analyses are presented below the CWS request:

- CWS Request: Use of aerial survey data and candidate habitat polygons identified by Sittler et al (2015) in relation to the caribou mapping in the Application (in the case of the habitat polygons), KUG Project and KS infrastructure and the direct and indirect zones of impact from the latter.
    - AuRico Response: AuRico found 29 locations (17% of observations within the same year and season) within the KS disturbance area (using a 500 m disturbance buffer) and 89 locations (52% of observations) within other existing disturbance areas in the LSA. AuRico did not find any caribou observations within the KUG Project disturbance areas. Overall AuRico reported a total of 118 caribou locations (64% of total locations from the same year and season) within existing disturbance areas, which AuRico

suggests implies that caribou do not completely avoid these disturbed areas. Despite several attempts at acquiring the habitat polygons identified in Sittler et al (2015), as of November 25, 2016 AuRico was unable to obtain them and therefore did not conduct this analysis for the EA.

- CWS Request: Combination of habitat loss and alteration data with KS impacts and expected impacts from the KUG Project, in addition to other key sources of potential cumulative impacts (e.g. mining, roads, and forestry).
    - AuRico Response: AuRico found that the greatest amount of habitat loss within the caribou RSA was due to roads (0.3% of RSA) and habitat alteration was due to cutblocks, fires and roads (4.3% of RSA). AuRico reported that the total area lost or altered in the caribou RSA was 4.6%, with the KUG Project contributing 0.002% to this amount.
- CWS Request: An updated analysis of the Chase herd CH which may be impacted by the KUG Project, including a quantitative analysis of impacts to CH including buffering human disturbance by 500 m, and a qualitative analysis considering literature on impacts from mines to caribou, including avoidance behaviour and potential population level effects. An assessment of disturbance to Chase herd CH in the RSA, including any disturbance to high elevation summer and / or winter range, low elevation summer range, low elevation winter range and connectivity range using human-caused physical disturbance and a 500 m buffer and / or fire disturbance in the last 40 years.
    - AuRico Response: AuRico did not identify any new disturbance areas in the RSA, noting that the only KUG Project related activity outside of the LSA (and inside the 2014 Chase herd boundaries) would be use of the ORAR. AuRico noted that impacts from use of this road (e.g. clearing of the road in the winter) was assessed in Appendix 15-C of the Application. However, AuRico reported on additional existing mitigation measures not contained in this appendix. Namely, there are existing provincial restrictions in WMU that are either near the ORAR or current Chase LPU, such as closing off areas to snowmobile (March 31 to November 30), ATV and motor vehicle use for hunting purposes, or to transport wildlife or hunters to and from hunting locations. AuRico reported that ECCC identified predation as the largest threat to southern mountain caribou and acknowledged that temporary snowmobile trails could facilitate the movement of wolves and therefore lead to increased predation. However, AuRico concluded that with the existing restrictions on vehicle use on the

ORAR and limited new access roads from the KUG Project they do not predict that the KUG Project would facilitate substantially increased access for predators into caribou habitat.

  - AuRico Response: AuRico calculated that existing disturbance in the 2014 CH polygons within the 2014 Chase herd LPU is at 26.5%, which is less than the 35% threshold outlined by the Southern Mountain Recovery Plan for low elevation habitat. This analysis did not include the 2016 updated CH mapping in the Chase herd LPU.

  - AuRico Response: AuRico reviewed the literature on caribou habitat use and avoidance and pointed out research suggesting that caribou avoidance zones are variable and might be less than the 500 m buffer suggested by CWS. AuRico stated that avoidance might vary by season and levels of human activity and concluded that caribou response to the KUG Project would vary. Additionally, they pointed out that there was evidence of caribou in the 500 m buffer around KS infrastructure. Concerning the subsidence zone, AuRico stated that navigating through this area would be similar to what caribou currently experience and they do not anticipate avoidance of the area.

- An assessment of the KUG Project's potential impact on the proposed Thutade herd and unassigned northern mountain caribou individuals, including potential larger-scale consequences of caribou displacement, site avoidance behaviour, impacts of subsidence and cumulative effects:

  - AuRico reported that <1% of the northern mountain population and between 2% and 9.5% of the proposed Thutade herd would be potentially affected by the KUG Project, using the average and maximum number of caribou per season observed within 500 m of existing disturbance in the LSA.

ECCC, FLNRO and TKN raised questions and concerns about the analysis provided by AuRico in response to ECCC information requests. For example, ECCC questioned why AuRico did not include winter clearing of the ORAR as disturbance and stated the effects assessment lacked information on habitat use and movement in the Chase LPU, noting that there are several migration corridors that cross the sections that would be cleared on the ORAR. Additionally, ECCC noted that as AuRico does not have strong pre-KS data on caribou for the area, they could not say with confidence what the effects of KS were in terms of the size of buffers that impacts caribou.

ECCC concluded that there were potential methodological problems and a high level of uncertainty in the assessment provided for Northern and Southern Mountain Caribou individuals. In ECCC's view, the uncertainty means that AuRico likely has underestimated the impact of the KUG Project on caribou and caribou habitat and given the uncertainty, ECCC is concerned that these impacts could "have an adverse effect on management objectives for the proposed Thutade herd and population and distribution objectives for the Chase herd, such that, in both cases, it may impact the ability to achieve the objectives for the species (northern mountain caribou and southern mountain caribou respectively). In this context, the effects have potential to be of high magnitude; local to regional geographic extent; long duration; and low reversibility". ECCC further clarified that a key consideration in terms of potential impacts to caribou is that mitigation measures should be applied sufficiently to reduce the risk of adverse effects. ECCC suggested that the above noted uncertainty may be addressed if AuRico were to undertake the following as part of the Caribou Management and Monitoring Plan:

1. Provide more specificity on monitoring (i.e., use of radio collars) in the vicinity of the KUG Project;
2. Propose measures to ensure adherence to speed limits/hunting prohibitions;
3. Propose mitigation measures known to be effective and regionally appropriate, based on a review of mitigation measures; and
4. Provide contributions in-kind or financial, at a level appropriate to the contribution of the KUG Project to effects on caribou and caribou habitat. This could be implemented through regional strategies to improve caribou habitat through restoration and/or access control, with the intent of ensuring no net increase in risk to caribou or their recovery.

FLNRO questioned whether caribou would continue to use the subsidence zone after it subsided, and whether AuRico had underestimated the number of northern mountain and Thutade herd individuals that might be affected by the KUG Project due to methodological issues. TKN identified a variety of items they viewed as inconsistencies in the caribou analysis and problems with methodology. They did not request additional work but proposed a caribou monitoring and management plan to verify predictions of the EA and minimize potential effects to caribou in the Chase and proposed Thutade herds. TKN recommended that this plan include provisions to improve the understanding of where the majority of the proposed Thutade herd animals are found within each season.

In order to reduce the potential impacts to caribou, EAO is proposing a Caribou Management and Monitoring Plan as an EAC condition (as part of the broader Wildlife

Management and Monitoring Plan to be developed in consultation with ECCC, TKN, FLNRO and ENV) that includes the following components / criteria:

- The plan must be informed by: the data Sittler et al (2015); and a review of mitigation measures, used by other industries and in other geographic areas, for caribou, their effectiveness and how they might be applicable to the KUG Project;
- Mitigation to and monitoring of restrictions on caribou movement in the area of subsidence and other potential areas of movement in the wildlife LSA;
- Identify opportunities to support caribou habitat through reclamation;
- Road decommissioning and restoration to close off access and reduce opportunities for movement of caribou predators in the KUG Project area;
- Participation in mitigation and monitoring initiatives that may be developed by FLNRO or ENV to inform an understanding of the caribou and their predators and improve caribou habitat in the caribou RSA; and
- Monitoring of the effectiveness of mitigation measures including monitoring of wildlife ramps over the water discharge line and other movement corridors with cameras.

As the caribou plan is a sub-component of the wildlife management and monitoring plan all relevant measures from the wildlife management and monitoring plan would also apply to caribou, for example:

- Caribou mitigation measures listed in Table 15.6-23 of the Application;
- Mitigation for noise associated with blasting for wildlife;
- Mitigation measures that are part of the ORAR Environmental Monitoring and Management Plan including attending meetings and participating in initiatives to inform environmental management and monitoring along the ORAR, including in relation to transportation related wildlife effects along the ORAR. This includes the requirement to implement measures identified by such initiatives.

Additionally, EAO is considering both habitat loss and alteration and sensory disturbance (in the LSA) as predicted residual effects to caribou. The former is discussed in the section above on residual effects. For sensory disturbance, the Application predicts the highest levels of disturbance would be in summer habitat due to instantaneous traffic noise, which would impact 94.9 ha of high quality summer caribou habitat (3.6% of high quality habitat in the LSA, and 0.02% of the RSA)[18]. These figures are over and above what was accounted for in the assessment of habitat loss and alteration. EAO notes that there is uncertainty regarding the volume of snowmobile or

[18] High quality habitat in the RSA was estimated using a proportional approach based on habitat in the LSA (see section 15.6.1.1 of the Application for an explanation of the calculation of proportional high quality habitat in the RSA).

other recreational traffic along the ORAR and the frequency with which such traffic might come into direct proximity to caribou and cause disturbance to the animals (FLNRO does not have statistics on snowmobile use in the region). Accordingly, EAO is proposing mitigation measures for sensory disturbance as part of the wildlife management and monitoring plan.

EAO is also proposing a condition requiring AuRico to enter into an agreement with FLNRO that would set out the terms of AuRico's participation in a program of activities that supports the conservation and management of caribou in the KUG Project area. The agreement may require AuRico to contribute up to $30,000 toward the cost of implementing the program.

EAO considers the uncertainty related to potential impacts on caribou from the KUG Project in the following context:

- With respect to the proposed Thutade herd, the province's caribou expert in ENV has characterized the impact of the KUG Project with respect to caribou habitat as "trivial". ENV noted that the incremental footprint of the mine would be very small, and would constitute a very minor proportion of the core habitat for the proposed Thutade herd.

- With respect to the Chase herd: while there is not complete information on the herd, there is also no information suggesting that the use, maintenance and winter clearing of an existing road (ORAR) would be the critical factor affecting the Chase herd. The Caribou Management and Monitoring Plan would ensure known mitigations are applied to mitigate adverse effects on caribou from the use of the ORAR.

- The proposed EAC condition of a Caribou Management and Monitoring Plan includes consideration of new information as it becomes available to inform the plan as well as adaptive management. Therefore, the mitigation plan can evolve with new information (e.g. because of future surveys and studies) over the life of the KUG Project.

- There are broader initiatives underway to address the current status of the Southern Mountain Caribou which includes the Chase herd. The federal and provincial governments are engaged in a critical habitat protection assessment (CHPA) study which will include consideration of what measures are required to recover the Southern mountain caribou. Learnings and new mitigation measures from that process could be applied to the future management of the Chase herd.

In light of these factors, EAO concludes that while uncertainty does exist, the uncertainty does not preclude the development of an acceptable caribou management

plan that would appropriately address the potential impacts of the KUG Project on the Chase and proposed Thutade herds. CWS and ENV have communicated to EAO that they agree with EAO's conclusion.

Additional Mitigation Measures

The wildlife working group recommended the following additional mitigation measures to EAO in order to further reduce potential effects on wildlife.

Mitigation measures recommended by FLNRO included:

- Use of specific types of lighting to reduce visual disturbance to wildlife, and to reduce impacts and attractants to bats;
- Maintain buffers for aircrafts around sensitive wildlife areas;
- Specific design and frequency of ramps over KUG Project TSF discharge line;
- Track wildlife mortalities and submit them to FLNRO;
- Create gaps at specific frequencies in snowbanks on all roads maintained by AuRico (including the northern section of the ORAR);
- Follow disturbance related General Wildlife Measures and those identified in the North Area Guidance Document except for safety or spill related emergencies;
- Avoid clearing trees where there are active denning sites;
- Pre-clearing surveys of bats, raptors, migratory birds and western toads must be conducted by a registered professional biologist; and
- An independent environmental monitor must be on site during construction to assess environmental compliance with the Sediment and Erosion Control Plan and other management plans; and
- Road deactivations.

Mitigation measures recommended by TKN included:

- Alpine species mitigation and monitoring plan to reduce effects to species of importance to TKN, such as hoary marmot and ptarmigan species. TKN recommends that the plan include wording that if effects to the marmot population occur an adaptive management approach would be implemented. The latter could include enhancement of nearby existing lower quality marmot habitat and/or relocation of the marmot colony to nearby suitable habitat;
- Mitigation and management measures to reduce attractants of roadside vegetation to moose (removal of early seral stage vegetation that provides moose forage);
- Adhere to requirements of ungulate winter ranges;

- Develop an ORAR Environmental Monitoring and Management Plan applicable to the northern portion of the ORAR where AuRico is the sole industrial user. This plan should include dust monitoring and have an adaptive management framework (this was also recommended by FLRNO); and
- Develop a blast management plan during construction and operations to minimize the sounds and sensory disturbance levels that may affect wildlife. The plan would include standard mitigation at the discretion of the Blaster in Charge, such as use of timing windows.

EAO agrees that these measures would be valuable in reducing possible effects to wildlife and recommends their inclusion as part of the proposed condition for a Wildlife Management and Monitoring Plan, which would be developed in consultation with TKN and relevant government agencies.

3.5.3 Analysis and Conclusions

EAO concludes that after the implementation of mitigation measures, the KUG Project would have the following residual adverse effects to wildlife:

- **Habitat loss and alteration**: woodland caribou, moose, grizzly bear, furbearers, hoary marmot, bats, raptors, migratory waterbirds, migratory land birds and western toad– due to land clearing, new infrastructure and subsidence;
- **Disruption of movement**: woodland caribou, moose, grizzly bear, wolverine, American marten and western toad – due to new access roads, increased traffic on existing roads, and new linear features (access corridor and water discharge line);
- **Sensory disturbance**: woodland caribou, migratory landbirds (olive-sided flycatcher) - due to instantaneous and continuous noise;
- **Direct mortality**: hoary marmot - due to impacts in the subsidence zone;
- **Attractants**: grizzly bear and wolverine – due to camp odours, waste, roadside vegetation and vehicle-killed wildlife carcasses; and
- **Indirect mortality:** woodland caribou, moose and mountain goat - due to increased predation from clearing of the ORAR in winter and increased recreational activity.

3.5.3.1 *Characterization of Residual Effects to Wildlife Valued Components (Excluding Caribou)*

Table 19: Summary of Residual Effects for Wildlife Excluding Caribou

Criteria	Assessment Rating	Rationale
Context	Low - Moderate resiliency	**General**: Forestry has occurred for decades in the region surrounding the KUG Project. Additionally, the past-operating KS is immediately adjacent to the site. These activities have affected the resiliency of wildlife in the region due to impacts such as habitat loss and disruption to movement.
Magnitude	Negligible to Moderate	**Habitat loss and alteration – low - moderate**: low levels of habitat loss impacts are less than 0. 1% of the RSA and less than 5% of the LSA (except for hoary marmot and olive-sided flycatcher, where impacts to habitat are predicted at ~ 7.5% of the LSA (moderate). **Disruption of movement – low to moderate**: low to moderate effects on disruption to movement are expected from linear developments in areas with observed or predicted species use due to the application of the following mitigation measures: crossing structures over the TSF discharge water line; and road culverts to facilitate wildlife movement. **Sensory disturbance – low:** low impact from sensory disturbance (up to 0.01% of RSA for the olive-sided flycatcher). **Direct mortality – low**: low potential impacts to hoary marmot in the subsidence zone, if dens are present there. **Attractants – low**: low impact on grizzly bears and wolverine as attractants would be greatly reduced by mitigation measures on site (identified in the Human Bear Conflict Prevention Plan and the Waste Management Plan). **Indirect mortality – negligible to low:** low impact on moose as mitigation to reduce snowmobile

Criteria	Assessment Rating	Rationale
		access into the northern part of the ORAR would be implemented; negligible impact to mountain goat as this species is not frequently preyed on by wolves in winter at high elevation and mountain goat habitat (high elevation rugged wind swept terrain) is often not suitable for snowmobiling.
Extent	Discrete to Regional	**Habitat loss and alteration, Direct mortality – discrete**: effects would be discrete because they would be confined to the KUG Project site where new development would occur (subsidence zone for all effects to hoary marmot; habitat loss in areas of clearing for new infrastructure). **Disruption of movement (moose, grizzly bear, wolverine, American marten, western toad), Sensory disturbance, Attractants – local:** effects would be confined to the LSA (e.g. disruption to movement from new linear features for wolverine). **Indirect mortality – regional**: effects would be regional as they would occur within the RSA.
Duration	Short term to Far Future	**Habitat loss and alteration (hoary marmot, moose, grizzly bear, furbearers, bats, raptors, migratory waterbirds, migratory land birds, western toad) – far future:** The effect on habitat loss in the subsidence zone for hoary marmot would be far future as it is uncertain whether hoary marmot would use this habitat after subsidence (if the slopes of the area are not too severe and some herbs grow then hoary marmot might use the area after subsidence occurs). The effects of habitat loss for the other above listed species would be far future as forests and other species' habitats take a long time to regenerate (beyond post-closure). **Disruption of movement – long term**: The effects from disruption to movement will persist into the long term as new linear infrastructure will remain in place until post-closure. **Sensory disturbance, Attractants – medium term**: Effects from sensory disturbance and attractants will persist to the medium term as these effects would be highest during the construction and

Criteria	Assessment Rating	Rationale
		operation phases. **Direct mortality – medium term**: The effect of mortality to hoary marmot would be medium term, as it is anticipated to occur when subsidence occurs, over operations. **Indirect mortality – medium term**: duration would be medium term as winter clearing of the ORAR would only occur during the construction and operations phases.
Reversibility	Reversible and Irreversible	**Habitat loss and alteration (moose, grizzly bear, furbearers, hoary marmot, bats, raptors, migratory waterbirds, migratory land birds, western toad), Disruption of movement, Sensory disturbance, Attractants – reversible**: Habitat effects would be reversible over a very long time frame as the forests and other species' habitat regenerates. Impacts from sensory disturbance and attractants would be reversible upon mine closure (when the source of the disturbance and attractants stops). Effects to disruption of movement would be reversible once linear features are removed and the areas reclaimed. **Habitat loss and alteration (hoary marmot), Direct mortality - irreversible**: Habitat loss and alteration may be partially reversible if the habitat in the subsidence area is used again for denning after subsidence occurs. If hoary marmots are occupying dens that are lost within the subsidence area there is the possibility that the individuals in the dens will die, thus direct mortality would be irreversible. **Indirect mortality – reversible**: effects would be reversible following the closure of the KUG Project when traffic levels and snow clearing schedule returns to current conditions.
Frequency	One Time, Sporadic and Continuous	**Habitat loss and alteration, direct mortality – one time - sporadic**: habitat loss and alteration for most species would be a one-time effect during vegetation clearing for development. Habitat loss and alteration and direct mortality for hoary marmot would be sporadic as effects would occur as

Criteria	Assessment Rating	Rationale
		subsidence occurs (which would not occur as a single event). **Disruption of movement, Attractants – sporadic**: Disruption of movement and attractants effects would be sporadic as they would depend on when the species is moving through the area (and when it encounters the linear infrastructure, in the case of disruption of movement). **Sensory disturbance – continuous**: effects of sensory disturbance would be ongoing and continuous through construction and operations. **Indirect mortality – sporadic**: the frequency of the effects from indirect mortality are sporadic due to the seasonal nature of the winter clearing that would cause the effect and the low frequency of recreational activity predicted in the region due to its remoteness (i.e. long distance from Mackenzie).
Likelihood	There is an overall moderate likelihood of adverse effects to wildlife (excluding caribou) occurring, as there is still moderate uncertainty regarding the use of key areas in the KUG Project site (e.g. access corridor location, subsidence zone) by the wildlife VCs.	
Significance Determination	EAO considered the low to moderate magnitude of residual effects, the potential long term or far future duration of some of these effects, and their reversible nature (except for impacts to hoary marmot due to subsidence). With AuRico's proposed mitigations, as well as proposed EAC conditions including mitigation and monitoring measures identified in the Wildlife Management and Monitoring Plan, EAO concludes that residual adverse effects to wildlife VCs (excluding caribou) would be not significant.	
Confidence	There is moderate confidence in the significance and likelihood determination for wildlife VCs (excluding caribou) based on the moderate understanding of the certainty of the data and models used in the assessment, the effects mechanisms and success of mitigation measures.	

3.5.3.2 *Characterization of Residual Effects to Caribou*

Table 20: Summary of Residual Effects for Caribou

Criteria	Assessment Rating	Rationale
Context	Low - resiliency	The Chase herd is listed as threatened under SARA and the proposed northern mountain population (which the proposed Thutade herd is part of) is listed as special concern. Both herds have been impacted by past and current development that has reduced their habitat and changed predator-prey dynamics.
Magnitude	Low to Moderate	**Habitat loss and alteration – low**: low levels of habitat loss in the mines site area as impacts are less than 3.5% of habitat combined for all seasons in the LSA and 0.01% of the RSA. No predicted habitat destruction of caribou CH. **Disruption of movement – moderate**: evidence of caribou use in the low elevation areas where linear features are planned (1.3 km of development through forested habitat for access corridor and discharge line). **Sensory disturbance – low:** low impact from sensory disturbance (3.6% of high quality habitat in the LSA, and 0.02% of the RSA). **Indirect mortality – low:** low impact as mitigation to reduce snowmobile access into the northern part of the ORAR would be implemented.
Extent	Discrete to Regional	**Habitat loss and alteration – discrete**: effects would be discrete because they would be confined to the KUG Project site where new development would occur (habitat loss in areas of clearing for new infrastructure). **Disruption of movement – discrete:** effects would be limited to areas around the KUG Project. **Sensory disturbance – regional:** effects would be regional as they are predicted for the KUG Project LSA and might occur due to the ORAR in the RSA.

Criteria	Assessment Rating	Rationale
		Indirect mortality – regional: effects would be regional as they would occur within the RSA.
Duration	Medium term to Far Future	**Habitat loss and alteration – far future**: The effects of habitat loss would be far future as forests and other habitat take a long time to regenerate (beyond post-closure). **Disruption of movement – long term**: The effects from disruption to movement will persist into the long term as new linear infrastructure will remain in place until post-closure. **Sensory disturbance – medium term:** Effects from sensory disturbance and attractants would persist to the medium term as these effects would be highest during the construction and operation phases. **Indirect mortality – medium term**: duration would be medium term as winter clearing of the ORAR would only occur during the construction and operations phases.
Reversibility	Reversible	**Habitat loss and alteration – reversible:** Habitat effects would be reversible over a very long time frame as the species' habitat regenerates. **Disruption of movement – reversible:** Effects to disruption of movement would be reversible once linear features are removed and the areas reclaimed. **Sensory disturbance – reversible**: Impacts from sensory disturbance would be reversible upon mine closure (when the source of the disturbance largely ends). **Indirect mortality – reversible**: Effects would be reversible following the closure of the KUG Project when traffic levels and snow clearing schedule returns to current conditions.
Frequency	One Time, Sporadic	**Habitat loss and alteration – one time**: habitat loss and alteration would be a one-time effect during

Criteria	Assessment Rating	Rationale
		vegetation clearing for development. **Disruption of movement – sporadic**: Disruption of movement would be sporadic as they would depend on when the species is moving through the area and encounters the linear infrastructure **Sensory disturbance – continuous:** Effects of sensory disturbance would be ongoing and continuous through construction and operations. **Indirect mortality – sporadic**: The frequency of the effects from indirect mortality are sporadic due to the seasonal nature of the winter clearing that would cause the effect and the low frequency of recreational activity predicted in the region due to its remoteness (i.e. long distance from Mackenzie).
Likelihood	There is an overall moderate likelihood of adverse effects to caribou occurring. As noted in the issues section above, there is still a moderate degree of uncertainty regarding key aspects of caribou use of the LSA and RSA, such as population trends, seasonal habitat use and movement. Due to this uncertainty, EAO is erring on the side of caution in categorizing the likelihood of potential effects to caribou as moderate.	
Significance Determination	EAO considered the low to moderate magnitude of residual effects, the potential long term or far future duration of some of these effects, and their reversible nature. With AuRico's proposed mitigations, the proposed EAC conditions including mitigation and monitoring measures identified in both the Caribou and Wildlife Management and Monitoring Plans, existing provincial mitigations (such as ungulate winter ranges) and the CHPA process underway, EAO concludes that residual adverse effects to caribou would be not significant.	
Confidence	There is moderate confidence in the significance and likelihood determination for caribou based on the understanding of the data and models used in the assessment, the effects mechanisms and success of mitigation measures. Adaptive management as stipulated in the conditions will allow adjustments to mitigations as new information becomes available.	

3.5.3.3 *Cumulative Effects*

Cumulative Effects from Habitat Loss and Alteration (Caribou, Moose, Grizzly Bear, Furbearers, Hoary Marmot, Bats, Raptors, Migratory Waterbirds, Migratory Land Birds, Western Toad), and Disruption to Movement (Moose, Grizzly Bear, Furbearers And Western Toad)

There could be interactions between the predicted residual effects of habitat loss and alteration, and disruption of movement from the KUG Project and other past, present or reasonably foreseeable projects or activities (see list in "other relevant projects" section above). In order to evaluate potential cumulative effects to habitat loss and alteration, the Application evaluated the amount of broad habitat type (by biogeoclimatic ecosystem classification BEC unit[19]) lost or altered in the appropriate RSA for each wildlife species. During the EA, AuRico conducted an additional analysis of potential residual effects to habitat loss and alteration for all wildlife VCs at EAO's request because EAO considers all effects from this indicator to be residual (see "20161124_A.1 KUG Comment EAO-004_CEA Wildlife_Memo"). To assess possible impacts from disruption to movement, the Application calculated road densities in the wildlife, caribou, and grizzly bear RSAs, noting that this metric was good to assess habitat fragmentation as if there is a greater density of roads it can be assumed that there is a greater degree of habitat fragmentation. The Application also used the same habitat based evaluation approach to assess disruption to movement, explaining that if habitat quality has been reduced from other projects wildlife might be less likely to use it, which would then create a disruption to movement (i.e. habitat loss and alteration is used as a proxy indicator for potential disruption to movement on the landscape). The results of these assessments are summarized in Table 21 below (the individual calculations of habitat units affected by other projects can be found in tables 15.8-2 to 15.8-2 in the Application and in 20161124_A.1 KUG Comment EAO-004_CEA Wildlife_Memo in response to EAO's request).

Table 21: Road Densities and Cumulative Habitat Loss

Species	RSA Used* for Calculatio	Road Density (km/km^2)	Cumulative Habitat Loss (ha)	% RSA** Cumulative Habitat	Cumulative Habitat Alteration	% RSA* Cumulative Habitat	Total (Lost + Altered; ha)	% RSA Cumulative Loss &
Caribou	Caribou	0.13	12,289.0	0.29	162,645.3	3.806	174,934.3	4.09
Moose**	Wildlife	0.08	3,941.8	0.27	59,326.6	4.07	63,268.4	4.35

[19] BEC: an ecological classification system used in BC. Information on this system can be found on the BC government website here: https://www.for.gov.bc.ca/hre/becweb/

Species	RSA Used* for Calculatio	Road Density (km/km^2)	Cumulative Habitat Loss (ha)	% RSA** Cumulative Habitat	Cumulative Habitat Alteration	% RSA* Cumulative Habitat	Total (Lost + Altered; ha)	% RSA Cumulative Loss &
Mountain Goat	Wildlife	N/A	3,887.0	0.27	59,356.1	4.08	63,243.0	4.35
Grizzly Bear	Grizzly Bear	0.12	8,558.5	0.28	135,625.9	4.406	144,184.4	4.68
Furbearers ** (American marten)	Wildlife	0.08	4,197.8	0.29	59,291.7	4.07	63489.5	4.36
Hoary Marmot	Wildlife	N/A	275.9	0.052	16,068.3	3.01	16,344.2	3.06
Bats – Roosting Habitat	Wildlife	N/A	3,920.7	0.37	58,451.2	5.47	62,371.9	5.84
Raptors	Wildlife	N/A	3,951.6	0.27	59,348.7	4.08	63,300.3	4.35
Migratory Waterbirds	Wildlife	N/A	3,891.3	0.36	58,478.4	5.48	62,369.7	5.84
Migratory Landbirds	Wildlife	N/A	4,254.6	0.29	59,404.1	4.08	63,658.7	4.37
Olive-sided flycatcher	Wildlife	N/A	3,855	0.3	58,543	4	62,398	4.29
Western Toad – Terrestrial Habitat	Wildlife	N/A	3,631.4	0.34	58,451.2	5.47	62,082.6	5.81

* Values used for cumulative effects calculations are the appropriate BEC units of the various RSAs
**All BEC units within the wildlife RSA contain suitable habitat for moose and furbearers (see Table 15.7-1 of the Application). Therefore the same amount of habitat is used for the cumulative effects calculations for these two VCs.

Conclusion – Cumulative Effects from Habitat Loss and Alteration

Given the low magnitude of the potential cumulative loss and / or alteration of habitat as a percentage of the RSA for all wildlife VCs (all values are less than 6%), the fact much of the cumulative impact to habitat alteration has been from past forestry activities and some of this habitat may have regenerated (i.e. the current analysis is conservative), EAO concludes that there would not be significant residual cumulative effects to these species from habitat loss and alteration.

Conclusion – Cumulative Effects from Disruption to Movement

EAO notes that the road densities in all of the RSAs are well below the threshold of 0.6 km/km^2 identified for negative effects to grizzly bears by the BC government (which is

lower than the 1.2 km/km^2 threshold noted in the literature for ungulates).[20] Additionally, there is a low magnitude of the potential loss or alteration of cumulative habitat as a percentage of RSA for caribou, moose, grizzly bear, furbearers and western toad (all values are less than 6%). Due to the combination of low density of roads and low levels of habitat loss and alteration in the RSAs, EAO concludes that there would not be significant residual cumulative effects to caribou, moose, grizzly bear, furbearers or western toads from disruption to movement.

Cumulative Effects from Sensory Disturbance (Olive-sided Flycatcher, Caribou)

EAO concludes that there would be no residual cumulative effects to olive-sided flycatcher or caribou from sensory disturbance as levels of disturbance from other potentially temporally overlapping projects within the wildlife RSA (e.g. mineral exploration, forestry; see Table 15.7-9 of the Application) would be negligible and short term.

Cumulative Effects from Direct Mortality (Hoary Marmot)

EAO concludes that there would be no residual cumulative effects to hoary marmot from direct mortality as mortality from other potentially temporally overlapping projects within the wildlife RSA (see Table 15.7-9 of the Application) would either not overlap with hoary marmot's typical alpine habitat (e.g. forestry), would not be likely to cause mortality (e.g. public recreation) or are not activities that target this species (e.g. guide outfitting and trapping).

Cumulative Effects from Attractants (Grizzly Bear and Wolverine)

EAO concludes that there would be no residual cumulative effects to grizzly bear and wolverine from attractants as it is expected that all other potentially interacting projects within the RSA would be employing similar mitigation measures as the KUG Project for attractant management and these effects from other projects would therefore be negligible.

Cumulative Effects from Indirect Mortality (ORAR) (Moose, Mountain Goat, Caribou)

The assessment of the effects of traffic and winter clearing of the northern portion of the ORAR is already a cumulative effects assessment as the evaluation considers other activities beyond the KUG Project (e.g. hunting, increased recreational use). Therefore,

[20]Grizzly Bear threshold: Grizzly Bear Population Status in B.C.. 2012 http://www.env.gov.bc.ca/soe/indicators/plants-and-animals/grizzly-bears.html (accessed online October 2016); Ungulate threshold: Beazley, K., Snaith, T., Mackinnon, F., & Colville, D. (2004). Road density and potential impacts on wildlife species such as American moose in mainland Nova Scotia. Proceedings of the Nova Scotian Institute of Science, 42(2), 339-357.

the residual effects analysis presented above is also the cumulative effects assessment. Accordingly, EAO concludes that there would not be significant residual cumulative effects to moose, mountain goat and caribou from indirect mortality from the ORAR because predicted residual effects would be negligible for mountain goat and low for moose and caribou and sporadic and reversible once the mine is in post-closure.

3.5.3.4 *Conclusion*

Considering the above analysis, and having regard to the mitigation measures identified in the TOC including the Wildlife Management and Monitoring Plan and the Caribou Program (which would become legally binding as conditions of the EAC), EAO is satisfied that the KUG Project would not have significant adverse residual or cumulative effects on wildlife.

3.6 The Terrestrial Environment: Terrain and Soils and Terrestrial Ecology

3.6.1 Background

Terrestrial ecosystems serve ecologically important functions, including: providing habitat for wildlife, rare plants and lichens and harvestable plants; water regulation; carbon sequestration; and nutrient cycling. Certain ecosystems may also be at-risk at the regional or provincial level and thus of additional importance. In this section, terrain and soils and terrestrial ecology are presented together because both are integral aspects of the terrestrial environment and impacts to terrain stability and soil have direct and indirect effects on terrestrial ecosystems.

3.6.1.1 *Description of Valued Components*

Nine VCs were included in the assessment for the terrestrial environment (listed below) based on the EA pre-application phase and consultation and consideration of the applicable regulatory, policy and legislative requirements. Concerns about terrain stability and erosion were raised by Aboriginal Groups and government agencies during the pre-application phase. In addition, characterization of terrain stability is required under the MA permitting process and pursuant codes. Potential effects of the KUG Project on terrain stability could lead to changes in the incidence and magnitude of landslides, which may lead to vegetation and terrestrial habitat loss, degradation of aquatic habitat and a variety of ecosystem effects. Increased geohazard risk also has implications for KUG Project infrastructure and occupational health and safety. Loss of soil and degradation of soil quality are frequently associated with metal mines and are also important drivers of ecosystems change and were, therefore, considered important to include as VCs.

<u>Terrain and Soils VCs</u>

- terrain stability;
- soil quantity; and
- soil quality.

<u>Terrestrial Ecology VCs</u>

- alpine and parkland ecosystems;
- forested ecosystems;
- wetland ecosystems;
- red- and blue-listed ecosystems;
- rare plants and lichens and associated habitat; and
- harvestable plants.

Further details on the VCs and rationale for their inclusion can be found in the Application sections 12.3.1 and 13.3.1.

3.6.1.2 *Study Areas*

The terrain LSA covers 5,340 ha surrounding the KUG Project and is the area in which direct effects on terrain stability could occur. The 16,600 ha soils LSA covers a larger area than the terrain LSA and includes the KS TSF (Application, Figure 12.3-1). Similar in area, the terrestrial ecology LSA (Application, Figure 13.3.1) covers 16,626 ha including proposed temporary and permanent surface infrastructure, historic KS infrastructure and areas of potential downstream effects. The LSAs are considered to be the boundary of KUG Project-related effects for the relevant VCs. The RSA for both terrain and soils and terrestrial ecology covers 1,455,177 ha of the three adjacent watersheds: Firesteel River, Toodoggone River, and Ingenikia River (Application, Figure 12.3-2 or Figure 13.3.1). This area was selected because of the potential for interactions between terrain stability and soil quality with local hydrology, water quality, and water dynamics in neighbouring watersheds. In addition, the RSA covers the habitat area for wildlife that is expected to come into contact with proposed KUG Project infrastructure.

3.6.1.3 *Proponent's Assessment*

<u>Terrain and Soils</u>

AuRico conducted baseline studies (Application, Appendix 12-A and12-B) of terrain and soil conditions to support the effects assessment and to guide KUG Project planning, management, and mitigation. The studies included terrain mapping, field studies and literature reviews, which were focused on identifying terrain and surficial geology and characterizing terrain stability and soils. AuRico identified key project-related effects to terrain and soils from an initial screening of interactions with KUG Project activities through a terrain stability assessment (Application Appendix 12-A), reviews of relevant scientific literature, project-specific data, government documents, information made available from stakeholders and Aboriginal Groups and professional judgement and experience.

AuRico identified the following KUG Project-related effects on the terrain and soil VCs:

- land subsidence;
- temporarily increased slope instability;
- loss of soil under component footprint, waste rock stockpile or vent and service road footprints;

- soil erosion, compaction, acidification, contamination, or moisture regime changes; and
- dust deposition.

AuRico predicts that subsidence would occur within a 34 ha zone as the panel caving method results in cave propagation to the surface 1.5 years after initiation. AuRico expects that subsidence would cause mass movement of surficial materials and substantial changes in terrain morphology and hydrology. The alpine ridge within the subsidence zone is predicted to be lowered by 60 to 80 m vertically with a final height approximately 20 m higher than the unaltered terrain in the alpine bowl to the west. A circular, steep walled crater and various forms of landslides are predicted within the 34 ha subsidence zone. The predicted increase in landslides would exceed the range of current local conditions. Changes in geomorphology and increased geohazard risk would also prevent human access within the subsidence zone. Further information on the restriction of access to the KUG Project and potential impacts on Aboriginal peoples is described in section 10 and Part C of this report. Mass movement and terrain instability in the subsidence zone are expected to impact terrestrial ecology, as described below, as well as groundwater and wildlife as described in sections 3.3 and 3.5 respectively, of this report.

In the updated feasibility study, AuRico identified that extraction level would be 20 m lower than original estimates (1140 m compared to 1160 m). AuRico does not predict that this 20 m change would result in a meaningful change to the surface and subsurface disturbance area.

In addition to subsidence, numerous construction, operations, and, to a lesser extent, closure activities may also contribute to terrain instability. Examples include construction of access corridors, portal facilities, water management and treatment infrastructure and construction of the closure spillway. The locations at the highest risk for geohazards are the decline portals and the north entrance to the access corridor tunnel.

AuRico predicts that ecologically functioning soil would be temporarily or permanently lost under the footprint of facilities such as the proposed portals, temporary ore and waste rock and materials stockpiles, sedimentation pond and roads. AuRico estimates that approximately 46 ha of land would be permanently lost under the footprint of components that will remain in place after closure. Panel cave mining is also expected to result in the permanent loss of 34 ha of soils due to subsidence.

AuRico expects that soil quality would be degraded by compaction from surficial traffic and soil handling; metal contamination from aerial deposition of dust and groundwater transport; potential chemical spills and acidification from atmospheric deposition of diesel engine emissions; and erosion of biologically important surficial soil. Soil quality

may also be indirectly affected by storage and handling, changes to drainage patterns, and changes to fire risk or moisture regimes near roads and other disturbed areas. AuRico also indicated in the updated feasibility study that dust emissions and deposition would be greater than originally predicted due to increase in tonnage and waste rock; however, AuRico did not predict, based on modeling, these increases to impact the characterization of effects.

Terrestrial Ecology

AuRico conducted a baseline study (Application, Appendix 13-A) of local ecological conditions to support the effects assessment and to guide KUG Project planning, management, and mitigation. The study included ecosystem mapping and field studies, which were focused on identifying ecosystems, wetlands and rare plants and lichens. Potential KUG Project interactions with terrestrial ecology VCs were identified by overlaying the proposed footprints for each phase of the KUG Project on the terrestrial ecosystem mapping and the known occurrences of rare plants within the LSA to determine areas of overlap. AuRico identified key project-related effects following an initial screening through reviews of relevant scientific literature, project-specific data, government documents, information made available from stakeholders and Aboriginal Groups and professional judgement and experience.

AuRico identified the following KUG Project-related effects on the terrestrial ecology VCs:

- surface disturbance;
- land subsidence;
- changes to hydrology, water quality, and/or water quantity;
- dust deposition;
- edge effects;
- introduction and/or spread of invasive plant species; and
- habitat fragmentation.

Construction and development activities associated with underground mining, installation of the ventilation exhaust raise and construction and use of roads are expected to result in loss of 1.5 ha and alteration of up to 74.8 ha of alpine and parkland ecosystems. AuRico identifies panel caving mining resulting in subsidence as being responsible for the majority of these effects. Subsidence may alter the physio-chemical characteristics of soil, reducing vegetation growth. Acid precipitation from mining equipment emissions, vehicle traffic and invasive species would also contribute to loss and degradation of alpine and parkland ecosystems.

AuRico predicts the loss of 34.3 ha and the alteration of 119.2 ha of forested

ecosystems resulting from vegetation clearing, soil salvage and site preparation for mine components during construction. Closure and reclamation activities are also expected to result in losses due to slope stabilization, re-contouring and maintenance activities, although reclamation is expected to restore ecological functioning to a portion of the affected lands.

A small area of wetlands may be lost or degraded by construction of the access corridor (0.2 ha) and sedimentation and dust deposition (2.1 ha). Although one provincially blue-listed wetland was originally identified in the LSA, further information indicated that it had been downgraded to yellow-listed and AuRico did not predict the KUG Project would impact this wetland. AuRico considered the proposed mitigation measures (listed below) as adequate to avoid residual effects to wetlands and thus, did not carry them forward in the assessment. Working Group and Halfway River First Nation (HRFN) comments on AuRico's conclusion of no residual effects to wetlands are discussed in the Discussion of Issues section below.

AuRico did not predict any KUG Project interactions with any blue- or red-listed ecosystems. Two blue-listed plant species are found within the LSA; however, AuRico did not predict KUG Project components to interact with these plant species or any rare plants or lichen populations identified within the LSA.

Much of the vegetated land within the LSA has the potential to support harvestable plants. Therefore, the type, distribution and abundance of harvestable plants may be affected by construction, operations and closure activities including subsidence, dust deposition, erosion, introduction or spread of invasive species or changes to hydrology. Subsidence could result in the loss of 13.5 ha of harvestable plant habitat and alteration of up to 34.2 ha of potential harvestable plant habitat. Other project-related effects (e.g., dust, erosion, invasive species, hydrology changes) could result in the loss of an additional 26.1 ha of habitat and alteration of 164.4 ha of potential harvestable plant habitat. AuRico originally considered the proposed mitigation measures as adequate to avoid residual effects to harvestable plants and thus, did not carry them forward in the assessment. This conclusion is discussed further in the Discussion of Issues section below. Potential impacts to First Nations as a result of impacts on harvestable plants are discussed in Part C of this report.

Mitigation Measures

AuRico addressed a number of potential effects through project design including:

- design as an underground mine to reduce effects on terrestrial ecosystem and limit dust emissions;
- use of existing KS facilities to reduce new surface disturbances;

- use of conveyors to transport ore from underground to the process plant to reduce vehicle emission and dust generation from road use; and
- relocating KUG Project components to avoid construction in unstable terrain and in proximity to wetlands and other water bodies.

AuRico also identified the following key mitigation measures:

- use of best management practices to reduce risks associated with terrain instability (i.e., slope stabilization techniques and erosion control measures);
- terrain stability and soil erosion monitoring;
- limiting vegetation clearing and salvage and stockpile soil to permit reclamation and re-vegetation;
- control of chemical, fuel and oil spills to avoid soil contamination;
- implementation of dust suppression measures as described in section 3.1 of this report;
- restoring ecological function through re-vegetation and ecosystem-based follow-up monitoring;
- treatment of new and existing invasive plant populations and inspection and cleaning of vehicles to prevent transport of plant propagules for target invasive species; and
- use of best management practices to protect wetlands (e.g., controlling leaching and sedimentation, re-vegetation using pre-development area species, re-establishing wetland functions).

A complete list of avoidance, mitigation and restoration measures can be found in the Application, sections 12.5.3 and 13.5.4. Proposed EMPs relating to terrain and soils and terrestrial ecology include:

- Reclamation and Closure Plan;
- Access Management Plan;
- Air Quality Management Plan;
- Emergency Response Plan (ERP);
- Surface Erosion and Sediment Control Plan;
- Environmental Emergency, Spill and Hazardous Materials Management Plan;
- Mine Waste, Tailings, and ML/ARD Management Plan;
- Soil Handling Management Plan;
- Ecosystems Management Plan;
- Invasive Plant Management Plan; and
- Subsidence Effects and Terrain Monitoring Plan.

Further details on these EMPs are found in section 9 of this report.

3.6.1.4 *Other Relevant Projects*

The LSA has historically been affected by mining projects including Lawyers, Baker, Shasta and KS; mineral exploration; forestry; grazing; and public recreation. The potential future Sustut Copper and Aley Niobium Projects also have the potential to impact the region. The Sustut Copper Project is located approximately 50 km south of the KUG Project while the Aley Niobium Project is located approximately 200 km southeast of the KUG Project. EAO notes that the Sustut Copper Project has since withdrawn from the EA process. Of these, the past and potential mining projects and mineral exploration have the greatest potential to interact with terrain and soil VCs. Forestry and public grazing may also have effects on terrain and soils. Terrestrial Ecology (i.e., harvestable plants, alpine and parkland and forested ecosystems) would be most impacted by forestry as well as past mining projects, mineral exploration and grazing.

3.6.2 Discussion of Issues

During Application review, EAO received comments on terrain and soils from NRCan and MEM and on terrestrial ecology from ECCC, TKN and HRFN. Comments relating to the key issues of harvestable plants and wetlands are discussed below. Please refer to the issues tracking table for the full list of individual comments.

TKN also raised concerns on the effect of road dust on nearby wildlife and wildlife habitat, which would also be relevant to the terrestrial environment since deposition of dust is predicted to negatively impact soil quality and terrestrial ecosystems, as described above. In response, EAO is proposing an EAC condition for dust management as part of the ORAR portion of the Wildlife Management and Monitoring Plan. Further details on this issue are provided in section 3.5 of this report.

<u>Harvestable Plants</u>

HRFN commented that a more thorough assessment of the abundance and distribution of harvestable plants should be provided. AuRico acknowledged that the complete and comprehensive list of harvestable plants in the LSA was not available at the time the Application was prepared. However, AuRico considered potential effects of the KUG Project on multiple ecosystem VCs that likely contain harvestable plants and considered the proposed mitigation measures (e.g., to avoid and minimize dust, erosion, spread of invasive plants, and changes to hydrology) as adequate to avoid residual effects to harvestable plants and thus, did not carry them forward in the assessment.

AuRico also indicated that potential effects to resource harvesting, including access to harvesting areas and environmental effects on plants and vegetation, were considered

as part of the Assessment of Aboriginal Interests (Application, Chapter 21). Further discussion of impacts to Aboriginal interests is provided in Part C of this report.

EAO sought feedback from HRFN on the adequacy of AuRico's responses to their comments and HRFN did not respond.

EAO did not concur with AuRico's characterization of no residual effects to harvestable plants. AuRico identified the loss of 39.6 ha and the alteration of 170.6 ha harvestable plant habitat. The mitigation measures identified by AuRico, such as dust suppression or controlling invasive plants, would not be sufficient to prevent impacts to harvestable plants in areas such as the subsidence zone, roads or areas of mine infrastructure footprint. Furthermore, residual impacts to alpine and parkland and forested ecosystems, while not significant, were long-term in some cases and the KUG Project could end up impacting certain species of harvestable plants, depending on their distribution. EAO requested further information from AuRico to characterize residual effects to harvestable plants and this information is presented in Table 22 below.

Wetlands

ECCC, TKN and HRFN raised concerns about effects to wetlands, which included the following points and recommendations:

- The conclusion of no residual effects on wetlands is not justified because KUG Project construction is predicted to result in the loss of 0.2 ha and alteration of 2.1 ha of wetlands area;
- AuRico should include the impact of the KUG Project TSF discharge pipeline on the Attichika Creek waterline in its assessment of effects to wetlands;
- Collection of baseline data and characterization of potential impacts to wetlands was inadequate to properly assess potential impacts to species at risk and migratory birds that could using the wetlands as habitat;
- A full assessment of wetland condition and function should be completed; and
- A wetlands management and monitoring plan should be prepared including details on mitigations measures for wetlands.

AuRico did not consider the loss of wetlands and effects to wetland function due to the KUG Project as residual because of the very small area of loss (0.2 ha), the limited alteration of wetland functions and the application of mitigation measures such as controlling leaching, sedimentation and impacts to wetland hydrology, the use of low-impact re-vegetation techniques and monitoring of wetland restoration activities to ensure success. In addition to mitigation measures, AuRico indicated that it minimized effects to wetlands through project design. For example, the route for the Attichika Creek discharge line was re-designed to avoid most wetlands.

With regard to this discharge line, AuRico indicated that the discharge infrastructure would consist of two 0.5 m diameter pipes, which would primarily be laid along the edge of an existing road and the surface of the wetland. Assuming a 5 m wide footprint to include the pipeline and a maintenance trail, the total loss through the undisturbed ecosystems (including wetlands) would be 0.3 ha. Exposed soil surfaces would be progressively revegetated during the appropriate growing season and conditions using seeds (and/or plants) suitable for the local area and ecosystems to avoid erosion and sedimentation, introduction of invasive plants, and to facilitate the re-establishment of ecological functions in the affected areas.

Finally, AuRico indicated that although a stand-alone wetland monitoring plan is not necessary because there would not be residual effects to wetlands, environmental protection measures relevant to construction activities are included in the conceptual Ecosystem Management Plan included in the Application (see Section 24.4.4 of the Application). The Ecosystem Management Plan would be developed in further detail to support the permitting process including additional and more detailed measures specific to mitigating adverse effects to wetlands from construction activities as well as monitoring requirements. AuRico anticipated that TKN would participate in the permit review process as a member of the Mine Review Committee to be established by the Major Mines Permitting Office (MMPO) and would have an opportunity to comment on management plans submitted as part of the application package. AuRico is also discussing additional TKN participation in development of EMPs as a part of ongoing Impact-Benefit Agreement (IBA) discussions.

EAO notes concerns with regard to baseline data collection for wildlife and habitat and a discussion of this issue are included in section 3.5. To ensure AuRico implements best management practices for, reduces impacts to, and undertakes monitoring of wetlands prior to, during and post-construction, EAO is proposing an EAC condition for wetlands management and monitoring as part of the Ecosystems Management Plan. With the application of this plan and considering the small area of the wetlands impacted by the KUG Project, EAO is of the view that residual impacts to wetlands from the KUG Project are not expected.

3.6.3 Analysis and Conclusions

EAO’s analysis of potential residual effects to terrain and soils and terrestrial ecology from the proposed KUG Project is presented below.

3.6.3.1 *Characterization of Residual Effects*

Terrain and Soils

Effects to terrain and soil would be difficult to fully mitigate because subsidence is inevitable, leading to a decrease in terrain stability and soil quantity. In addition, roads and infrastructure retained following closure would have permanent effects on soil quantity and quality. EAO has identified the following residual effects:

- increased risk of geohazards due to subsidence and to footprint development in unstable or erodible terrain;
- loss of soil in subsidence area and under retained roads; and
- loss of soil quality in subsidence buffers, retained road buffers, and in reclaimed areas.

Terrestrial Ecology

No residual effects were identified for wetlands, considering the proposed EAC condition that would require wetlands management and monitoring. Residual effects are predicted for direct and indirect effects on harvestable plants, alpine and parkland ecosystems and forested ecosystems, including:

- loss and alteration of harvestable plant habitat;
- loss of alpine and parkland ecosystem extent and function;
- alteration of alpine ecosystem function due to subsidence;
- loss of forested ecosystems through surface clearing and permanent infrastructure; and
- alteration of forested ecosystems though edge effects.

Table 22: Summary of Residual Effects for Terrain and Soils and Terrestrial Ecology

Factor	Rating	Rationale
Context	Low to neutral	**Terrain and Soils:** EAO rates soil quality as low context because resiliency of the receiving environment is expected to be low with low productivity and high acidity (resulting in low buffering capacity) soils. EAO considers the context of soil quantity and terrain stability as neutral because the receiving environment may be able to respond and adapt to the effect.

Factor	Rating	Rationale
		Terrestrial Ecology: EAO considers harvestable plants and forested ecosystems to be neutral context because they may be able to adapt to imposed stresses and represent common ecosystems and species in the RSA. EAO rates alpine and parkland ecosystems as low for context since they may have low resiliency to disturbance. EAO also notes that alpine and parkland ecosystems are rarer ecologically than some other ecosystems and could represent high elevation caribou habitat, as discussed in section 3.5 of this report.
Magnitude	Low to high	**Terrain and Soils:** Effects on terrain stability would be high due to the substantial geomorphological effects that are beyond the range of natural variation including in the subsidence zone and at the decline portal. Effects on soil quantity are also of high magnitude because 46 ha of soil are expected to be permanently lost. Effects on soil quality are expected to be medium since they would be substantially different from baseline conditions. **Terrestrial Ecology:** The magnitude of the loss and alteration on alpine and parkland and forested ecosystems and harvestable plants is considered low because the severity of effects is limited and a small percentage of the ecosystems within the LSA are affected.
Extent	Local	The majority of terrain and soil and terrestrial ecology effects would occur at the site level, in the subsidence zone and under and in proximity to roads and other KUG Project infrastructure.
Duration	Short-term to permanent	**Terrain and Soils:** Effects to terrain stability are expected to persist for the medium term, eventually reaching a pre-disturbance state following closure. Effects to soil quality and quantity would be of far-future to permanent duration, lasting into the post-closure phase and beyond. **Terrestrial Ecology:** Within parkland and alpine

Factor	Rating	Rationale
		ecosystems, certain ecosystems such as the tussock forming Altai fescue - Arctic willow Tundra and Mountain heather Heath have low resiliency to disturbance and will take a long time or be unable to recover from geomorphological changes associated with subsidence; hence, effects to these ecosystems would be of permanent duration. Effects to talus and scree slopes, which make up the majority of the affected area in alpine and parkland ecosystems and are considered resilient and adapted to disturbance, would be of short-term duration. Effects to forested ecosystems would be long term to far future because of the time required for mature forest regeneration. Effects to harvestable plants would be of medium duration as plants can re-establish relatively quickly compared to trees.
Reversibility	Reversible-irreversible	**Terrain and Soils:** Soils within the subsidence zone and roads and infrastructure that remain following closure would be permanently lost. Effects on terrain stability and soil quality would be reversible. **Terrestrial Ecology:** The effects of surface clearing and creation of edges on forested ecosystems as well as effects to harvestable plants are considered reversible. For alpine and parkland ecosystems, the changes to ecosystem function and extent are considered permanent due to the difficulty and level of effort typically associated with returning these types of ecosystem to a pre-disturbance level.
Frequency	Sporadic to continuous	**Terrain and Soils:** Effects on terrain stability and soil quantity would occur throughout the duration of operations. **Terrestrial Ecology:** Effects to forested ecosystems are predicted to occur both sporadically (e.g., windthrow) and continuously (e.g., fragmentation and

Factor	Rating	Rationale
		edge effects) until the point of site stabilization. Effects to alpine and parkland ecosystems and harvestable plants would be sporadic, occurring with changes to the environment from the KUG Project such as surface clearing.
Likelihood	Low-High	**Terrain and Soils:** While the probability of a landslide associated with roads and infrastructure is low, the probability of a landslide associated with subsidence resulting from the panel caving mining method as well as at the decline portal is considered to be high. The likelihood of loss of soil under retained infrastructure and degradation of soil is considered high. **Terrestrial Ecology:** Likelihood of effects on the terrestrial environment is high due to surface clearing activities and resulting changes to soil and vegetation.
Significance Determination	Not significant	**Terrain and Soils:** Considering the localized nature of effects; the ability of the receiving environment to respond to effects to terrain stability and soil quality; the fact that the Mackenzie Land Resource Management Plan (LRMP) objectives would continue to be met; and the proposed mitigation, reclamation and monitoring measures, EAO is satisfied the proposed KUG Project would not have significant adverse effects on terrain and soil. **Terrestrial Ecology:** EAO predicts that effects to forested ecosystems and harvestable plants would be neutral context and reversible. While effects to parkland and alpine ecosystem would be rated low for context and could be permanent, overall, EAO predicts that effects to the terrestrial ecosystem would be of low magnitude and localized extent and would not interfere with the ability to meet Mackenzie LRMP objectives. Therefore, EAO does not predict significant adverse effects on the terrestrial ecosystem from the KUG Project.

Factor	Rating	Rationale
Confidence	Moderate to high	**Terrain and Soils:** There is a good understanding of the proposed mining methods and its effects on stability and all necessary data are available to support the assessment. Understanding of the relationship between soil quality and KUG Project activities is good and most of the necessary data are available; however, variation in the range of predicted effects is possible, resulting in moderate confidence in the conclusions of the assessment. **Terrestrial Ecology:** Confidence in terrestrial ecosystem effects is considered to be moderate because of the uncertainty regarding the degree of change and the specific responses of individual ecological communities. The success of reclamation activities is also uncertain, although this uncertainty could be reduced by information on the successful reclamation efforts at KS, which could be required during permitting.

3.6.3.2 *Cumulative Effects*

Cumulative effects from KUG Project and other relevant projects in the RSA (identified in the Other Relevant Projects section) were assessed for the VCs with predicted residual effects, including: terrain stability, soil quality, soil quantity, alpine and parkland ecosystems and forested ecosystems.

Cumulative effects to terrain and soil include:

- increased geohazard risk due to increasing proportion of disturbed land in the RSA;
- cumulative loss of soil quantity; and
- cumulative degradation of soil quality.

EAO considers that the probability of KUG Project subsidence effects interacting synergistically with other relevant projects to be low because of the distance between projects (KS is the closest project at 4-6 km away). However, additive and synergistic effects to terrain stability could occur between KS and KUG Project in the vicinity of the KUG Project TSF and temporary rock and ore storage piles. Cumulative soil loss and soil degradation could also occur with both synergistic and additive interactions.

Cumulative effects on terrain and soil are expected to affect less than 5% of the RSA.

Mitigation measures include the optimization of available development alternatives to avoid unstable areas and minimize disturbance as well as progressive reclamation following operations. AuRico would be required by MEM to apply safety standards and best management practices such as spill response, dust control, ML/ARD management as well as conduct monitoring to track effects to terrain and soils and adjust management plans and mitigation measures, as necessary.

EAO concludes that the cumulative effect of increased geohazard risk is of low magnitude, localized extent, long-term duration, low likelihood and not significant. EAO concludes that the cumulative effect to soil quantity and quality is of low (soil quality) to high (soil quantity) magnitude, localized extent, long-term duration, high likelihood and not significant. EAO notes that confidence in this assessment is moderate. Certain terrain and soil risks are inherently uncertain because they depend on a number of unknown external variables such as weather and seismic activity; in addition, the long-term nature of soil effects makes predictions more challenging. However, there is a good understanding of effects of the proposed mining techniques and infrastructure development and operation and closure of KS has provided additional knowledge and experience.

Cumulative effects to terrestrial ecosystems include:

- incremental loss and alteration of ecosystems due to infrastructure development;
- invasive plant transport; and
- windthrow and edge effects from clearing and road development.

Approximately 4% (60,260 ha) of alpine, parkland and forested ecosystems within the total RSA (1,455,177 ha) is identified as altered and 0.2% (3117 ha) is lost. Forestry accounts for the majority of the lost area while roads and KS account for the majority of lost habitat. The proposed KUG Project would be expected to lead to an additional 44.1 ha of lost and 313.0 ha of altered alpine, parkland and forested area. Because the distribution of harvestable plants is not available for the RSA, forested, parkland, and alpine habitat was all assumed to be capable of supporting harvestable plant habitat in the RSA. Therefore, the cumulative loss and alteration of potential harvestable plant habitat within the RSA boundary is the same as for alpine, parkland and forested ecosystems (3,117 ha lost and 60,260 ha altered). The majority of the changes to harvestable plant habitat are attributable to forest harvesting and the creation of roads in the south-eastern portion of the RSA between 1980 and 1999. These numbers are considered conservative because many of these ecosystems will have regrown after they were harvested; however, some will be in the stem exclusion stage and availability of harvestable plants will be low for up 60 years due to high stand density and low light

levels.

Mitigation measures for the terrestrial environment are the same as those identified above in the Mitigation measures section. EMPs and relevant guidelines and standards would be applied, resulting in the implementation of safety measures, best management practices, and mitigation methods.

EAO concludes that the cumulative effects to alpine and parkland and forested ecosystems and harvestable plants is of low magnitude, regional extent, far future duration, of high likelihood and not significant. EAO notes that confidence in the assessment is moderate. Although there is a good understanding of the likely effects of KUG Project development, information on many of the projects and historic activities in the RSA is inadequate to fully assess the extent and distribution of effects of these projects on alpine and parkland and forested ecosystems.

3.6.3.3 *Conclusions*

Considering the above analysis and the proposed conditions identified in the TOC and CPD, including wetlands management and monitoring as part of the Ecosystems Management Plan and the Wildlife Management and Monitoring Plan, which would become legally binding as schedules of an EAC, EAO is satisfied that the proposed KUG Project would not have significant adverse effects on terrain and soils or terrestrial ecology.

4. Assessment of Socioeconomic Effects

4.1.1 Background

The KUG Project is expected to impact the socio-economic environment of the region and province through effects on employment, both direct and indirect. Economic effects including changes to employment and labour market conditions are expected, as well as social effects such as changes in individual and family income, training and skills development, work rotation schedule and family dynamic effects following from employment effects. Other types of social effects, such as changes in land use, may also occur.

The regional economy is based on natural resource industries such as mining and forestry as well as the service sector. The combined labour force in the RSA is approximately 125,490 (based on the 2011 Census of Canada). The unemployment rates in 2011 in Kwadacha (25%), Tsay Keh (22%), Takla Landing (27%), Mackenzie (9%) and Prince George (10%) were higher than the BC average unemployment rate of 8%, while Smithers (8%), and Terrace (8%) were the same as the BC average.

4.1.1.1 *Description of Valued Components*

The following VCs were included in the assessment of potential KUG Project socio-economic effects based on the EA pre-application phase and consultation and consideration of the applicable regulatory, policy and legislative requirements. These include:

- Aboriginal labour market conditions;
- non-Aboriginal labour market conditions;
- community well-being; and
- Aboriginal community well-being.

Aboriginal communities were interested in economic issues relating to Aboriginal labour market conditions such as the type of employment opportunities available, the percentage of workforce that would be Aboriginal and the training opportunities available. Both Aboriginal and non-Aboriginal labour market conditions were considered important to include because the KUG Project is expected to create close to 4,000 person-years of employment over the life of the mine, which would impact the labour market of the Potentially Affected Communities (PAC), described below. Aboriginal communities and government agencies were interested in effects of the KUG Project on community well-being that may result from the KUG Project such as changes to family dynamics and social behaviour. Further details on the VCs and rationale for their

inclusion can be found in the Application sections 16.3.1 and 17.3.1.

4.1.1.2 *Study Areas*

Socio-economic effects were investigated within the PAC, which are those communities that are proximate to the KUG Project or likely to provide a portion of the KUG Project workforce and associated goods and services. The seven PAC for KUG Project include three Aboriginal communities (Kwadacha, Tsay Keh and Takla Landing) and four municipalities (Mackenzie, Prince George, Smithers and Terrace). Consideration of effects at the regional scale permits characterization of the wider social and economic trends in the vicinity of the KUG Project. The RSA includes four regional districts in north-central BC: the Regional District of Fraser-Fort George, PRRD, Regional District of Bulkley-Nechako and Regional District of Kitimat-Stikine.

4.1.1.3 *Proponent's Assessment*

Since the KUG Project would transport workers to and from the mine site by air and workers could come from a variety of communities, it is termed a "fly-in, fly-out" (FIFO) operation, and would not result in the creation of highly localized impacts that historically occurred through the creation of one-employer resource towns. Instead, socio-economic impacts would be expected to occur throughout the PAC and the RSA. The KUG Project is expected to create an average of 220 jobs per year over the five-year construction phase, 377 jobs per year over the 13-year operations phase, 54 jobs per year over the six-year closure phase and 10 jobs per year over the post-closure phase. For the purposes of the assessment, Northern BC residents are expected to make up a minimum of 50% of the workforce and at least 10% of the workforce is expected to be Aboriginal.

<u>Economic Effects</u>

Economic VCs (Aboriginal and non-Aboriginal labour market conditions) could be affected by competition for skilled labour, wage inflation and loss of employment related to closure. During construction and operations, demand for skilled labour would increase in the RSA and PAC as a result of hiring at the KUG Project. Businesses in these communities could therefore have difficulty finding skilled workers or be forced to compete with wages offered by the KUG Project. During closure, a reduced need for workers would result in a loss of direct employment and indirect employment for suppliers.

Social Effects

Effects to both community well-being and Aboriginal community well-being would primarily include 1) changes to worker stress and lifestyle choices and 2) changes to family dynamics and family/community stress. Stress on workers may be induced by the nature of the work environment and the FIFO rotation. Higher income and stress may also lead individuals to make poor lifestyle choices and engage in high-risk behaviours. Effects on workers may lead to effects on the quality of family time at home. Combined with increased time away from home, overall family stress may increase. Cumulative effects on individuals and families may lead to community-wide effects and strains on health and social services.

In addition to the above effects, Aboriginal Community well-being may also be affected by:

- income disparity within Aboriginal communities created by high-paying mining jobs;
- reduced ability of workers to participate in Aboriginal cultural activities; and
- loss of employment at closure (smaller Aboriginal communities may be less able to recover from these job losses than larger more-economically diverse communities).

The KUG Project would also provide opportunities for improved Aboriginal and non-Aboriginal community well-being, such as increased income, opportunities for workers to advance training and experience and time for workers to spend on other pursuits during time off (the FIFO schedule is typically two weeks on, two weeks off). The balance of benefits and challenges would vary among individuals and communities.

Mitigation Measures

AuRico identified the following mitigation measures to address economic effects:

- develop and implement a Workforce Transition Plan to assist employees in identifying and securing new employment after mine closure;
- specialised skill and on-the-job training, including training for new workers, to reduce competition for skilled labour and wage inflation; and
- preferential hiring of Aboriginal workers and residents of northern BC.

AuRico identified the following mitigation measures to address social effects:

Health and Wellness Management Plan (HWMP)

The HWMP will describe AuRico's planned actions to promote the physical and mental health, safety and wellness of workers including initiatives such as promoting healthy lifestyle choices, monitoring worker well-being, providing access to counselling and implementing drug and alcohol testing and expectations.

Employee and Family Assistance Program (EFAP)

The EFAP will form part of the employee benefits program and provide access to financial management resources, personal counselling and other forms of personal assistance such as access to resources for addressing substance abuse or mental health. The EFAP will also identify existing social and family support services within the PAC that can be accessed through workers' health plans or benefits.

Worker Orientation and Training

The standard orientation for all on-site workers will include social and health information such as information on AuRico's health and wellness programs; on and off-site resources and benefits; cultural awareness training; and resources and techniques for stress management, conflict resolution and time management.

Access to Communications

AuRico will provide internet and telephone services to on-site workers to enable communication of workers with their family and others.

Aboriginal Employment and Training Resources

AuRico will employ an Aboriginal Liaison Officer who will engage with prospective Aboriginal applicants and provide information about employment opportunities, qualifications and details of working at the mine site. This officer will also engage with workers and their families to identify and manage well-being issues such as financial management, job-related stress or workplace conflict.

Engagement with Aboriginal PAC

AuRico will communicate regularly with Aboriginal PAC to stay informed of any social changes within Aboriginal communities and potential connections to the KUG Project. If

any issues are identified, AuRico will work collaboratively with Aboriginal leadership to identify and implement additional mitigation and management measures.

Pre-recruitment Information Sessions

AuRico will host sessions in each of the Aboriginal PAC prior to recruitment for construction or operations to provide information on employment expectations, challenges and opportunities associated with FIFO mine employment as well as specific information on the hiring process.

Engagement with Local Health and Social Services Providers

AuRico will maintain communication and information sharing with health and social service providers in Aboriginal and non-Aboriginal PAC and in the RSA to proactively identify and address issues and concerns related to community well-being and service provisions.

Full details on potential socio-economic effects and mitigation measures for the KUG Project are provided in sections 16.5 and 17.5 of the Application.

In addition, AuRico states that socio-economic mitigation measures pertaining to TKN would be included in the IBA, which may include provisions related to employment, training and well-being. Impacts to First Nations and mitigations are also discussed in section 10 of this report, which includes an assessment of how environmental effects caused by the KUG Project affect socio-economic and health conditions of Aboriginal peoples as well as Part C, the Aboriginal Consultation Report.

4.1.1.4 *Other Relevant Projects*

Of the past, current and potential projects in the RSA, only the Aley Niobium Project, a proposed open pit mine, has the potential to interact cumulatively with economic effects from KUG Project. The Aley Niobium Project would be located approximately 200 km southeast of the KUG Project and could be expected to affect the same PAC over its anticipated mine life of 2017 to 2046. If the Aley Niobium Project is developed according to the estimated timelines stated by that project's proponent, the construction and operations phases of the Aley Niobium Project and KUG Project would overlap and the two projects would have some similar labour and skills requirements. Mining or other industrial projects with a large non-local workforce could have the potential to interact with social effects from the KUG Project in the PAC and particularly in transportation hubs such as Smithers, Prince George and Mackenzie.

4.1.2 Discussion of Issues

During Application review, EAO received comments from Northern Health and the PRRD on social effects and comments from HRFN on social and economic effects. These comments are included in the issues tracking tables. Key issues include:

- effects on transportation hubs;
- effects on workers and families;
- health and medical services;
- consultation and consideration of HRFN; and
- other concerns, as discussed below.

Effects on Transportation Hubs

Northern Health expressed concerns that AuRico did not adequately discuss the potential socio-economic effects associated with the influx of temporary workers through transportation hubs ("flyover effects"), in communities such as Smithers, Prince George and Mackenzie, as well as impacts related to KUG Project truck operators passing through Mackenzie. Examples of the potential effects concerning Northern Health include:

- impacts on community infrastructure and services;
- crime rates;
- cost of living and availability/affordability of housing;
- impacts on vulnerable individuals (e.g., sexual exploitation and violence against women);
- communicable disease rates;
- community cohesion; and
- traffic-related injury rates

Northern Health further requested that AuRico complete a review of community experiences from projects similar to the KUG Project, including KS, and develop a Social Economic Effects Management Plan.

AuRico responded that they would not accommodate workers during their commute, reducing the incentive for workers to spend time in transportation hubs. Based on the KS experience, AuRico expects northern BC residents to comprise around 50% of the workforce, which would reduce the potential for effects in transportation hubs associated with these employees. Although AuRico is of the view that effects in transportation hubs are unlikely and they do not predict residual social effects from the KUG Project, they indicated that the EA should be solutions-focused and consider the

best management practice for the industry. AuRico suggested they could develop a plan for communication and engagement with communities, First Nations, and service providers (including Northern Health, Royal Canadian Mounted Police) over the life of the KUG Project on social issues.

Northern Health was not satisfied by AuRico's response and stood by their original comments regarding the "flyover effect" of transient workers through communities. EAO agrees that the likelihood of neighbouring communities experiencing socio-economic effects as a result of the KUG Project is not high; however, having mechanisms in place to address potential impacts on community well-being, in the event they occur is a prudent strategy. EAO proposes an EAC condition for a Socio-community and Economic Effects Management Plan to describe AuRico's plans for communicating and engaging with the community; the process for issues management; and the means by which the HWMP and EFAP, described in the Mitigation Measures section above, would be implemented.

Northern Health requested that effects to community well-being be assessed during periods of economic decline that could result in lay-offs and shutdowns. AuRico indicated that the effects of a possible temporary closure on workers and their families would be similar to the experience at closure and, if such an event occurred, mitigation measures proposed for closure could be implemented to support and assist workers and their families. AuRico plans to develop and implement a Workforce Transition Plan to assist employees in preparing for new employment. EAO notes that the Socio-community and Economic Effects Management Plan could also serve to address community-related effects from temporary or permanent closure of the KUG Project, should they occur.

Effects on Workers and Families

The PRRD requested that AuRico justify why stress on families during FIFO wouldn't create residual effects. AuRico responded that research indicates that a minority of workers engaged in FIFO experience stress that affects family relationships and furthermore, that all workers experience benefits from KUG Project employment. AuRico has proposed mitigation measures based on best practices in the mining industry to support employees and families to reduce stress associated with FIFO, including the HWMP. These are described in the information on Mitigation Measures within the Proponent's Assessment section above. Considering the mitigation measures planned to target social effects and the proposed condition for a Socio-community and Economic Effects Management Plan, EAO is satisfied that effects would be minimized.

Health and Medical Services

Northern Health expressed concerns about the pressure the KUG Project would place on the health care system in the region. Northern Health emphasized that the context of health services demand in the region is an important consideration. Issues include, but are not limited to, the cumulative impacts of temporary workforces on health services in the region and the existing challenges of rural service delivery. Northern Health noted that any increases in demand associated with the non-resident workforce will not be within the health services capacity of the PAC. Northern Health also noted that the magnitude of residual effects to local health services would depend on the level of on-site care provided by AuRico. Northern Health requested that some magnitude of residual effect to medical services be acknowledged (due to trauma and secondary care impacts). Northern Health indicated that, in their recent experience with mining projects, they have observed projects with several medical transfers to their facilities each week (per project) and have also provided support to mining projects for communicable disease management at the camp (e.g., for influenza and gastrointestinal illness) or other issues. Northern Health indicated that that, regardless of the level of care provided on site, both occupational and non-occupational injuries and illnesses will require some number of patients to transfer to Northern Health facilities for specialized urgent care needs (e.g., heart attacks, gastro-intestinal illness, appendicitis, kidney infection). Workers with chronic illnesses will require medical support, and at times, may require transfer to Northern Health facilities.

Northern Health recommended that indicators for available medical services include changes in health services demand and service level requirements. They also requested that information on the level of care that would be provided by primary health and medical services on-site is included in a HMSP.

During VC scoping, effects to health services were excluded from the assessment because AuRico expects minimal in-migration and concomitant effects on health services in communities in northern BC. However, to address the need for workers to access health services, AuRico will provide medical services on-site at the KUG Project and will also support the health and well-being of workers through the EFAP and the HWMP, both of which would provide various health and counselling services. AuRico acknowledges that there could be a small increase in health services demands for workers requiring emergency or urgent care but predicts this would occur infrequently. During KS, AuRico indicated the number of evacuees to Smithers for urgent medical care was approximately 7-8 per year with a maximum of 20 in one year. EAO considers the information provided on the KS experience to be a reasonable predictor of primary medical services demand from the KUG Project and does not expect this to constitute a residual effect on medical services. Northern Health did not share this view. To address

potential issues relating to health care capacity in the region and also to ensure that health services are coordinated for workers that require transfer off-site, EAO proposes an EAC condition requiring the development of a HMSP that conforms to Northern Health's "Health and Medical Services Plan Best Management Guide for Industrial Camps".

Consultation and Consideration of HRFN

HRFN is of the view that AuRico should have engaged more fully with them on potential impacts and benefits of the KUG Project because of their history of use within the area; further, they should have been included as a PAC.

AuRico responded that its level of engagement with HRFN was based on the guidance provided by EAO and the Agency regarding consultation with Aboriginal Groups listed on Schedule C of the Section 11 Order. AuRico engaged with HRFN on a number of occasions including: introducing them to the KUG Project and proposing a consultation approach, providing a summary report on publicly-available information regarding HRFN use of the lands, responding to specific technical comments from HRFN on potential impacts to the Peace River Watershed. AuRico described that its approach for identifying PAC was to select First Nations communities within or adjacent to the KUG Project as well as regional service centres for business, transportation, mining services and supplies that were determined to be most affected by the KUG Project. EAO sought feedback from HRFN on the adequacy of AuRico's responses to HRFN's comments. HRFN did not respond. EAO is satisfied that the requirements identified in the Section 11 Order have been met. Further information on the HRFN is provided in Part C of this report.

Other Concerns

Northern Health raised a number of other issues that they did not consider to be satisfactorily addressed by AuRico. These issues include:

- the quality of the data used to inform the baseline assessment;
- the comprehensiveness of the indicators used in the baseline assessment;
- the existing health status of populations, including the identification of health vulnerabilities;
- historical setting of the KUG Project area (boom-bust cycles and impacts that have been experienced in the region);
- cumulative effects on communities;
- how work rotation and the camp environment would result in residual adverse impacts to workers (effects would not be entirely mitigated);
- effects on vulnerable populations; and

- the assessment methodology employed.

EAO acknowledges that additional baseline data on the socio-economic status of the population (e.g., including information such as health status) and a more detailed analysis with more comprehensive indicators would be informative and provide greater confidence in the EA predictions. However, in EAO's view, the baseline and project-effects assessments met the requirements of the AIR and were commensurate with the potential socio-economic effects. As discussed above and concluded below, EAO is satisfied that the KUG Project would not have adverse residual socio-economic effects because of the FIFO operation and the mitigations and proposed EAC conditions. In EAO's view, further analysis and consideration of the listed issues above would not alter this conclusion. Further details on these comments and AuRico's responses are included in the Working Group issues tracking table.

4.1.3 Analysis and Conclusions

4.1.3.1 *Characterization of Residual Effects*

Despite the mitigation measures proposed, mitigating all economic effects is impossible. Residual effects are expected for labour market condition VCs due to loss of employment at closure and competition for skilled labour and wage inflation during construction and operations. EAO's analysis of these residual effects is described in Table 23 below.

Mitigation measures for social effects have been practiced at other remote mining operations and are expected to be effective in mitigation potential effects of the KUG Project on community well-being and Aboriginal community well-being. No residual adverse social effects are anticipated.

Table 23: Summary of Residual Effects for Economic Effects

Factor	Rating	Rationale
Context	Low to neutral resilience	Closure of the KUG Project would result in the loss of the majority of the employment associated with the KUG Project. The effect of this loss on Aboriginal and non-Aboriginal labour market conditions would depend on the economic conditions at the time of closure, including the availability of positions at other mines or in other industries.

Factor	Rating	Rationale
		Aboriginal Labour Market Conditions: As Aboriginal workers often face greater barriers to employment, they could face disproportionately greater challenges in finding new employment and their resiliency would be low. **Non-Aboriginal Labour Market Conditions:** Resiliency is predicted to be neutral because the labour market may be able to respond to the loss of employment. Resiliency of the labour market to competition for labour is also predicted to be neutral as affected businesses should be able to find other skilled workers or train new workers.
Magnitude	Medium to high	**Aboriginal Labour Market Conditions:** High magnitude effects on changes in employment in the Aboriginal labour market are expected at closure as the approximately 38 Aboriginal workers that could be employed at the KUG Project would have to find new employment. Compared to the approximately 200 people in the Aboriginal PAC labour force, this would constitute a high magnitude effect. Competition for labour and wage inflation is expected to be of low magnitude during construction and greater (medium) during operations, due to the higher number of workers employed at operations compared to construction. **Non-Aboriginal Labour Market Conditions:** The magnitude of changes in employment at closure and competition for labour and wage inflation effects would be medium during construction and operations. Although a number of mitigation measures are planned, hiring and then ceasing to employ hundreds of employees would have an effect on the labour market. Relative to the size of the non-Aboriginal PAC

Factor	Rating	Rationale
		labour force (approximately 51,000 people), this represents a smaller proportion of affected people than in the Aboriginal labour market.
Extent	Community to beyond regional	**Aboriginal Labour Market Conditions:** Competition for skilled Aboriginal labour could occur at the community level during construction and operations while loss of employment at closure could be noticeable in Aboriginal unemployment levels at the regional level. **Non-Aboriginal Labour Market Conditions:** The KUG Project will require a specialised workforce from PAC, the RSA and beyond therefore labour market effects are expected at the beyond regional level. Effects on the labour market from closure are expected to be regional since loss of project-related jobs could have the potential to increase unemployment at the regional level but not beyond.
Duration	Short	**Both Aboriginal and Non-Aboriginal Labour Market Conditions:** Effects on labour market conditions are expected to be short (less than 5 years) since workers are expected to be well-positioned to find employment at closure and affected businesses should be able to adjust to competition for labour and wage inflation.
Reversibility	Reversible	**Both Aboriginal and Non-Aboriginal Labour Market Conditions:** All effects are expected to be reversible as both workers and the labour market adjust to changing employment status of the KUG Project.
Frequency	One-time to sporadic to continuous	**Both Aboriginal and Non-Aboriginal Labour Market Conditions:** Effects of competition for labour and wage inflation are expected to occur continuously throughout construction but be sporadic during operations since they would primarily be an issue at the initial phase of operations. The effect of loss of employment at closure would be a one-time event.

Factor	Rating	Rationale
Likelihood	Low to high	**Aboriginal Labour Market Conditions:** The likelihood of competition for Aboriginal workers at construction is predicted to be low given the low number of Aboriginal workers expected to be employed at this stage while the likelihood of labour market effects at operations and closure is predicted to be moderate because there are greater number of employees to be hired and ultimately lose their employment at closure. **Non-Aboriginal Labour Market Conditions:** The likelihood of non-Aboriginal labour market effects is moderate at construction and operations and high at closure.
Significance Determination	Not significant	**Both Aboriginal and Non-Aboriginal Labour Market Conditions:** Effects are expected to be short-term, reversible and medium to high magnitude as well as within the range of historic variation. In addition, EAO considers the experience that would be gained by employees working on the KUG Project would help them find future employment. Therefore, changes in employment and competition for labour and wage inflation are not expected to be significant.
Confidence	Moderate to high	**Aboriginal Labour Market Conditions:** For all Aboriginal labour market effects, confidence is moderate because there are a number of unknown external variables (e.g., the number of Aboriginal workers that would be hired at the KUG Project, employment opportunities available at the time of closure) and the effectiveness of the mitigation measures could be moderate or high. **Non-Aboriginal Labour Market Conditions:** For the labour market effects during construction and operations, confidence is moderate due to unknown external variables (e.g., regional economic circumstances) while confidence is

Factor	Rating	Rationale
		high of closure-related effects because there is a good understanding of the cause-effect relationship between the KUG Project and effects on employment on the non-Aboriginal labour market.

4.1.3.2 *Cumulative Effects*

EAO identified a potential cumulative effect from the hiring efforts of the KUG Project and the proposed Aley Niobium Mine that could increase competition for skilled Aboriginal and non-Aboriginal workers and contribute to wage inflation if the Aley Mine is developed in the timeframe proposed by its proponent. The effect would to take place during the construction (five years) and operations (13 years) phases. The Aley Niobium mine has the potential to create approximately 700 direct jobs during a 24- to 30-month construction period and 350 direct jobs during operations. EAO concludes that the cumulative effect of increased competition for skilled Aboriginal and non-Aboriginal workers and the contribution to wage inflation is of low to moderate magnitude, regional to beyond regional in extent, medium term duration, of low to moderate likelihood and not significant. EAO notes there is uncertainty to whether or not the effect would occur, and to what extent, as the Aley Niobium mine is currently in the pre-Application stage of the EA process.

EAO did not predict a cumulative interaction for the change in employment as the projects are not expected to have coinciding closure dates. No other projects or activities are expected to cumulatively interact with the economic effects of the KUG Project.

4.1.3.3 *Conclusions*

Considering the above analysis and the proposed conditions identified in the TOC, including the conditions requiring the development of a Socio-Community and Economic Effects Management Plan and an HMSP, which would become legally binding as schedules of an EAC, EAO is satisfied that the KUG Project would not have significant adverse effects on social or economic conditions.

5. Assessment of Human Health Effects

5.1.1 Background

The transportation and management of ores, chemicals and tailings for the KUG Project would generate noise and release pollutants into the air, soil and water. Vegetation and animals could absorb and consume these pollutants, resulting in contamination of country foods. Human health in the region could be impacted through the consumption of drinking water and country foods, inhalation of air, incidental ingestion of soil, dermal exposure to soil and exposure to noise. AuRico conducted an HHRA to assess the potential short and long term health impacts of exposure to chemical emissions from the KUG Project. In this HHRA, AuRico did not assess the risks to health of workers on the job because occupation exposure is addressed through various provincial legislation, codes and guidelines as well as the Occupational Health and Safety Plan, which is a MA permit application requirement.

In this section, risks to Aboriginal health from the consumption of potentially contaminated country foods and other routes of exposure are described. Impacts to Aboriginal health are also discussed specifically in section 10, which includes a summary of environmental effects from the KUG Project on Aboriginal peoples, and in Part C, which includes a discussion of impacts of the KUG Project on Aboriginal Interests.

5.1.1.1 *Description of Valued Components*

AuRico selected human health as a receptor VC with the following indicators:

- noise;
- air quality;
- drinking water quality; and
- country foods quality.

AuRico selected these indicators by determining the most likely exposure pathways and media through which human health could be affected. AuRico also consulted with Aboriginal communities, government agencies, the public and stakeholders to inform their selections.

5.1.1.2 *Study Areas*

AuRico selected and defined the study areas (Application, Figure 18.3-2), in consultation with EAO and the Working Group. The KUG Project Area contains existing and new infrastructure required for the KUG Project, above and below ground, as well

as a buffer area to accommodate potential siting changes of infrastructure prior to final design. The LSA incorporates the KUG Project footprint and surrounding area within which there is a potential for immediate direct and indirect effects on human health due to an interaction with KUG Project components or activities, taking into consideration exposure from noise, air quality, drinking water and consumption of vegetation and wildlife (country foods). The human health RSA is the spatial area within which there is a potential for direct and indirect interaction and cumulative effects to occur. In selecting the human health RSA, AuRico considered the RSAs for other VCs, which could impact human health including surface water quality, air quality, wildlife and noise. The human health RSA therefore follows the same boundary as the RSA for terrain and soils, terrestrial ecology, and wildlife (excluding caribou and grizzly bear) and incorporates the smaller area of the surface water quality RSA.

5.1.1.3 *Proponent's Assessment*

AuRico conducted an HHRA to evaluate potential health effects of the KUG Project, which uses an exposure scenario involving hypothetical individuals, representing adults, sensitive adult populations (e.g., the elderly and those with pre-existing medical conditions) and toddlers, who are exposed to noise, breathe air and consume drinking water (from surface water sources), incidentally ingested soil and country foods harvested from within the LSA 365 days per year. Consumption rates for country foods are based on a study, which took place in 2008-2009, of First Nations living on reserve in the same ecozone as the KUG Project (from the BC First Nations Food, Nutrition and the Environment Study BC FNFNES) and include various meat, fish and berries (see Application, Appendix 18-A for further details). AuRico considers this assessment to be conservative because the only known full-time residents within the LSA are KUG Project workers residing at the mine bunkhouse, which are not present 365 days a year due to time off-site (most work schedules are two weeks on, two weeks off). Other Aboriginal and non-Aboriginal individuals visit the RSA on a periodic basis for camping, fishing, hunting or gathering. The assessment for noise and COPCs are described below.

<u>Noise</u>

AuRico assessed the potential for noise from the KUG Project to disturb sleep, interfere with speech, cause loss of hearing or result in general complaints. The noise modelling results for continuous and instantaneous noise levels reaching the camp bunkhouses during the construction and operations phases indicate no predicted exceedances of threshold values in any of the noise scenarios examined (see Application, Appendix 18-B, Section 3.1). AuRico predicts that the camp bunkhouse is sufficiently insulated from noise and blasting events to prevent adverse effects to off-duty workers. Therefore, no residual effects from the noise indicator for human health were identified and noise is

not carried further in the assessment. Due to the remote location, AuRico did not assess noise effects on communities or individuals outside the KUG Project boundaries. The closest communities would be too far away to experience audible noise from the KUG Project (the KwN community of Fort Ware is 79 km away by air; all other communities are over 100 km away).

Contaminants of Potential Concern

AuRico examined exposure to 19 COPC (Table 24 and Table 25) using a multi-media approach that included exposure through air inhalation, dermal contact with soil and ingestion of drinking water (from surface water sources), soil and country foods. These COPCs were selected from an initial screening of 38 chemicals for their potential to bioaccumulate or exceed soil, drinking water or fish tissue guidelines. AuRico modeled health risks using hazard quotients (HQ) for threshold chemicals (i.e., non-carcinogens) and incremental lifetime cancer risk (ILCR) for non-threshold chemicals (i.e., carcinogens). HQ are the ratio of the estimated daily intake of a substance, to the toxicity reference value (a specific threshold value for COPCs). HQs over 1.0 indicate that the exposure to that COPC is greater than the toxicity threshold level. For threshold COPCs, Health Canada suggests that an HQ of less than 0.2 indicates that the exposure does not pose a significant health risk to human receptors. An HQ of 0.2 is used (instead of 1.0) because additional intake of these parameters, above and beyond breathing air, drinking water or eating country foods from within the KUG Project area could occur through a variety of exposure routes (e.g., environmental exposure during time spent outside the KUG Project area, ingestion of retail foods, smoking or secondhand smoke). Note that exposure of workers on-duty at the mine site was also not considered, which may be higher than the exposure experienced by the general public. For non-threshold COPCs, the ILCR is calculated based on an estimate of exposure and risk. According to Health Canada, an ILCR less than 1×10^{-5} is considered to be of negligible risk to human health.

AuRico evaluated the magnitude of risk by examining the change between the baseline scenario (Application, Appendix 18-A) and construction and operations phase scenarios (Application, Appendix 18-B). The baseline scenario is based on measured and modeled data for air, water and soil quality and contaminant levels in fish, vegetation and wildlife in the area from the past twenty years. The majority of these studies were conducted recently by AuRico in support of the Application although additional long-term studies were also incorporated. The construction and operations phase scenarios combine conditions in the baseline scenario with the predicted effects from the KUG Project, taking into account mitigation measures proposed such as water treatment and point source emission controls. Further information on levels of COPCs in air, water, fish and wildlife are available in section 3 of this report.

The baseline, construction and operations HHRA risk characterizations for threshold COPCs determined that HQs for non-carcinogenic chemicals were all below 1.0 (Table 24 and Table 25). However, HQs for Al, Cr, Hg, and methylmercury (MeHg) in toddlers, Al and Hg for adults, and MeHg in sensitive adult populations were greater than 0.2. This suggests that under existing and KUG Project conditions, there could be risks to human health due to these metals. As shown in Table 24 and Table 25, estimates of Total Estimated Daily Exposure (TEDE) and HQ for the various COPCs are very similar across baseline, construction and operations scenarios. Increases in TEDE between baseline and project phases are predicted to be (≤0.0007 mg/kg BW/day for COPCs with HQs greater than 0.2). Therefore, AuRico predicts minimal change in the risk to human health from threshold COPCs due to the KUG Project.

For carcinogenic metals via the inhalation route (i.e., As, Cd, Cr, and Ni), individual and summed ILCRs during construction and operations were all below the threshold of negligible risk (Application, Chapter 18, Table 18.5-4. For As, which is also considered carcinogenic through ingestion, potential risks to human health from this exposure pathway were identified because the ILCR was elevated (2.19×10^{-5} and 2.18×10^{-5}), during construction and operations, respectively. However, AuRico considers these predictions to be conservative due to the overestimate of exposure duration, as described above. In addition, the ILCR for ingested As during baseline conditions was very similar (2.10×10^{-5}).

Overall, AuRico concluded that during the construction and operations phases, several metals may affect human health (Al, Cr, Hg, and MeHg for toddlers; Al and Hg for adults, and MeHg for sensitive adults; and ingested As for ILCR). However, the risk to human health from these COPCs is the same or similar to the risk calculated in the baseline HHRA (Table 24 and Table 25). The incremental change in HQs and ILCRs due to the KUG Project is very small (≤0.008). Therefore, based on the results of the baseline HHRA and the KUG Project-related HHRA, AuRico does not expect a KUG Project-related change in human health and did not identify residual effects to human health.

Table 24: TEDE to COPCs from all exposure pathways (water only for nitrate and SO_4) for adults and HQ for baseline conditions and construction and operations phases

COPC	Baseline		Construction		Operation	
	TEDE (mg/kg BW/day)	**HQ**	**TEDE** (mg/kg BW/day)	**HQ**	**TEDE**(mg/kg BW/day)	**HQ**
Nitrate	1.74×10^{-2}	1.09×10^{-2}	2.11×10^{-2}	1.32×10^{-2}	1.86×10^{-2}	1.16×10^{-2}
SO_4	1.28	9.18×10^{-2}	1.33	9.47×10^{-2}	1.35	9.66×10^{-2}
Al	7.35×10^{-2}	**0.245**	7.32×10^{-2}	**0.244**	7.42×10^{-2}	**0.247**
As	1.19×10^{-5}	3.98×10^{-2}	1.24×10^{-5}	4.15×10^{-2}	1.22×10^{-5}	4.08×10^{-2}
Ba	6.40×10^{-4}	3.20×10^{-3}	6.54×10^{-4}	3.32×10^{-3}	6.56×10^{-4}	3.28×10^{-3}
B	8.74×10^{-4}	4.99×10^{-2}	8.70×10^{-4}	5.02×10^{-2}	8.94×10^{-4}	5.11×10^{-2}
Cd	1.02×10^{-5}	1.02×10^{-2}	1.02×10^{-5}	1.02×10^{-2}	1.02×10^{-5}	1.02×10^{-2}
Cr	9.83×10^{-5}	9.83×10^{-2}	9.91×10^{-5}	9.80×10^{-2}	9.96×10^{-5}	9.96×10^{-2}
Cu	1.40×10^{-3}	9.92×10^{-3}	1.42×10^{-3}	1.00×10^{-2}	1.43×10^{-3}	1.01×10^{-2}
Pb	7.87×10^{-5}	2.20×10^{-2}	8.31×10^{-5}	2.33×10^{-2}	7.84×10^{-5}	2.20×10^{-2}
Mn	2.80×10^{-3}	1.80×10^{-2}	2.83×10^{-3}	1.81×10^{-2}	2.82×10^{-3}	1.81×10^{-2}
Hg	9.64×10^{-5}	**0.321**	9.64×10^{-5}	**0.321**	9.64×10^{-5}	**0.321**
MeHg (general adult population)	5.17×10^{-5}	0.110	5.24×10^{-5}	0.112	5.26×10^{-5}	0.112
MeHg (sensitive populations)	5.17×10^{-5}	**0.225**	5.24×10^{-5}	**0.228**	5.26×10^{-5}	**0.229**
Mo	7.80×10^{-5}	2.79×10^{-6}	8.34×10^{-5}	2.97×10^{-6}	8.17×10^{-5}	2.92×10^{-6}
Ni	1.37×10^{-4}	5.46×10^{-3}	1.38×10^{-4}	5.52×10^{-3}	1.44×10^{-4}	5.75×10^{-3}
Se	2.04×10^{-4}	3.58×10^{-2}	2.46×10^{-4}	4.32×10^{-2}	2.41×10^{-4}	4.22×10^{-2}
Tl	3.23×10^{-6}	4.61×10^{-2}	3.22×10^{-6}	4.61×10^{-2}	3.21×10^{-6}	4.59×10^{-2}
Vanadium (V)	2.24×10^{-4}	2.49×10^{-2}	2.24×10^{-4}	2.49×10^{-2}	2.24×10^{-4}	2.49×10^{-2}
Zn	1.64×10^{-3}	2.87×10^{-3}	1.62×10^{-3}	2.85×10^{-3}	1.63×10^{-3}	2.85×10^{-3}

Note: Those COPCs for which HQ exceed 0.2 are in bold font.

Table 25: TEDE to COPCs from all exposure pathways (water only for nitrate and SO_4) for toddlers and HQ for baseline conditions and construction and operations phases

COPC	Baseline		Construction		Operation	
	TEDE (mg/kg BW/day)	**HQ**	**TEDE** (mg/kg BW/day)	**HQ**	**TEDE** (mg/kg BW/day)	**HQ**
Nitrate	2.99 x 10-2	1.87×10^{-2}	3.62×10^{-2}	2.26×10^{-2}	3.19×10^{-2}	1.99×10^{-2}
SO_4	2.20	0.157	2.27	0.162	2.32	0.166
Al	0.215	**0.717**	0.215	**0.716**	0.175	**0.582**
As	4.79×10^{-5}	0.160	4.89×10^{-5}	0.163	4.81×10^{-5}	0.160
Ba	1.67×10^{-3}	8.37×10^{-3}	1.72×10^{-3}	8.58×10^{-3}	1.67×10^{-3}	8.37×10^{-3}
B	1.58×10^{-3}	9.06×10^{-2}	1.59×10^{-3}	9.11×10^{-2}	1.62×10^{-3}	9.25×10^{-2}
Cd	1.99×10^{-5}	1.99×10^{-2}	1.98×10^{-5}	1.98×10^{-2}	1.99×10^{-5}	1.99×10^{-2}
Cr	3.17×10^{-4}	**0.317**	3.19×10^{-4}	**0.319**	3.14×10^{-4}	**0.314**
Cu	3.02×10^{-3}	3.32×10^{-2}	3.06×10^{-3}	3.37×10^{-2}	3.07×10^{-3}	3.37×10^{-2}
Pb	1.80×10^{-4}	5.03×10^{-2}	1.87×10^{-4}	5.25×10^{-2}	1.60×10^{-4}	4.49×10^{-2}
Mn	7.90×10^{-3}	5.81×10^{-2}	7.94×10^{-3}	5.84×10^{-2}	6.59×10^{-3}	4.85×10^{-2}
Hg	2.07×10^{-4}	**0.689**	2.07×10^{-4}	**0.689**	2.07×10^{-4}	**0.689**
MeHg	1.11×10^{-4}	**0.482**	1.12×10^{-4}	**0.489**	1.13×10^{-4}	**0.490**
Mo	1.57×10^{-4}	6.83×10^{-6}	1.67×10^{-4}	7.25×10^{-6}	1.59×10^{-4}	6.92×10^{-6}
Ni	3.30×10^{-4}	1.32×10^{-2}	3.32×10^{-4}	1.33×10^{-2}	3.39×10^{-4}	1.36×10^{-2}
Se	4.09×10^{-4}	6.60×10^{-2}	4.93×10^{-4}	7.95×10^{-2}	4.82×10^{-4}	7.77×10^{-2}
Tl	6.92×10^{-6}	9.88×10^{-2}	6.91×10^{-6}	9.87×10^{-2}	6.76×10^{-6}	9.65×10^{-2}
V	7.85×10^{-4}	8.72×10^{-2}	7.85×10^{-4}	8.73×10^{-2}	6.02×10^{-4}	6.69×10^{-2}
Zn	3.60×10^{-3}	7.49×10^{-3}	3.57×10^{-3}	7.45×10^{-3}	3.56×10^{-3}	7.42×10^{-3}

Note: Those COPCs for which HQ exceed 0.2 are in bold font.

Following the completion of the construction and operations phase HHRA, which is presented in the Application, AuRico revised its Feasibility Study, which affected AuRico's prediction of air and surface water quality. While the updated predictions of PM concentrations are higher than originally predicted, they remain below BC ambient air quality objectives. AuRico also predicted that impacts on exposure estimates to metal COPCs from air inhalation would be minor. In the revised surface water quality predictions, AuRico now expects Al and Cd to be higher than originally predicted and exceed surface WQG in some instances and locations during a limited number of years of the KUG Project (see Section 3.3 of this report for further details). However, AuRico predicts the change to TEDE would not be materially affected by these updated estimates. This is because the locations with exceedances make up only 3 of the 14 locations that the estimate of human exposure to COPCs from water (via drinking water and country foods) is based on. Further, AuRico indicates the changes in surface water quality would be of short duration, low frequency and reversible. Therefore, although these revised COPC exposure estimates are not reflected in the calculated TEDEs and HQs, AuRico indicates that its conclusions of no residual impacts to human health remain unchanged from the Application. Working Group concerns related to these updated predictions are described in the Discussion of Issues section below.

Mitigation Measures

AuRico addressed a number of potential human health effects through project design including:

- air emission controls, as described in Section 3.1 of this report; and
- water treatment, effluent discharge controls and mine water management, as described in Section 3.3 of this report.

AuRico also identified the following key mitigation measures:

- mitigations to reduce emissions to air and control dust as described in section 3.1;
- mitigations to prevent impacts to water quality, as described in section 3.3;
- proper maintenance and operation of equipment to reduce noise;
- implementing site procedures to minimize noise, e.g., turning off equipment not in use, keeping doors closed;
- conducting loud procedures indoors, where practical, and identifying enclosures, berms, acoustic screening, and shrouding where stationary sources require control;
- minimizing blasting during shift changes and instantaneous charge per delay (a measure of blast intensity) to reduce disturbance to workers;

- control of general access to mine site to limit human health exposure to air, drinking water, soil and noise impacted by the KUG Project;
- restricting hunting, fishing, trapping and possession of firearms within the mine site and in the vicinity of the KUG Project area to minimize the collection of country foods in areas with greatest potential for country food contamination, as per the Restricted Area agreement described in Part C of this report (Restricted Area); and
- implementing additional mitigation measures to decrease risk to human health if an unacceptable level of risk is indicated through monitoring and modelling (adaptive management).

Mitigations to reduce the release of COPCs and dust to air and water would also reduce the contamination of country foods with COPCs.

A complete list of avoidance, mitigation and restoration measures can be found in the Application, Section 18.5.3. Proposed EMPs that are relevant to human health include:

- Closure and Reclamation Plan;
- Access Management Plan;
- Air Quality Management Plan;
- Ecosystems Management Plan;
- Fish and Aquatic Effects Monitoring Plan;
- Groundwater Monitoring Plan;
- Mine Waste, Tailings, and ML/ARD Management Plan;
- Soil Handling Management Plan;
- Surface Erosion and Sediment Control Plan;
- Surface Water Management Plan;
- Water Treatment Plan; and
- Wildlife Management and Monitoring Plan.

Requirements for these EMPs would be addressed through the MA permit application requirements, as described in section 9 of this report. EAO has also proposed a Wildlife Management and Monitoring Plan, which would address dust along the ORAR (See section 3.5) and an EAC condition for an Air Quality Management Plan to address air quality concerns within the KUG Project mine site including requirements for dust mitigation and monitoring and criteria air contaminant mitigation (see section 3.1.2). The plan would also include requirements for PM to address concerns to KUG Project employee health while on-site but off-duty, described in the Issues section below. Under the joint MA and EMA permit application requirements, air quality monitoring and mitigation requirements would relate to ambient air quality beyond the mine site but not

address indoor air or outdoor air at the camp.

5.1.1.4 *Other Relevant Projects*

AuRico does not predict that any other projects would interact with the KUG Project to create cumulative effects on human health.

5.1.2 Discussion of Issues

EAO received review comments on the health sections of the Application from Health Canada, Northern Health and HRFN. Other concerns regarding air quality were also received from ENV, TKN and ECCC and are discussed in Section 3.1 of this report.

Below, EAO has summarized the key EA issues that required resolution as part of the Application Review phase. The issues tracking tables include all comments received for health related comments, including those that were for clarification.

Based on a review of the Application and with feedback from the Working Group, the following key issues related to AuRico's assessment of health were identified:

- drinking water;
- PM exposure;
- metals in dust;
- consideration of indoor air quality;
- exposure to COPCs in country foods;
- conservativeness of estimates within the HHRA; and
- other concerns, as discussed below.

<u>Drinking Water</u>

Surface Water

Northern Health requested comparison of updated surface water quality predictions to drinking water guidelines. AuRico compared the updated surface water quality predictions with health-based criteria, including the BC Drinking WQG and the Health Canada Guidelines for Canadian Drinking Water Quality and found that all parameters were below health-based water quality criteria for drinking water. AuRico indicated that the potential for health impacts will be considered in the design of the surface water monitoring program that would be part of the EMA process, and monitoring data will be compared to the BC and Canada Drinking WQG, in addition to criteria for the protection of aquatic life. Drinking water is regulated in the province of BC under the *Drinking*

Water Protection Act (2001) and Drinking Water Protection Regulation (B.C. Reg. 200/2003), which set minimum water treatment standards and ensure water quality through monitoring.

Groundwater

Northern Health raised concerns that AuRico did not consider groundwater as a source of drinking water (and COPCs) in the HHRA. Northern Health noted that permits under the *Drinking Water Protection Act* (2001) and Drinking Water Protection Regulation (B.C. Reg. 200/2003) are issued based upon the existing conditions at the time of permitting, and are not designed to be protective of substantial changes to environmental media (as is expected due to KUG Project activities). Northern Health advised that current permits will not ensure the early detection of effects to groundwater quality, and thus human health effects may occur. Further, Northern Health noted that in the HHRA, contaminant uptake through all pathways was summed, and that this should have included the drinking of groundwater at the camp. Northern Health also expressed concern about whether future groundwater wells could be constructed in the area, and that it should be ensured that these potential receptors will be protected from health effects.

In response, AuRico acknowledged that groundwater used as a drinking water source requires monitoring and management to ensure human health is protected. AuRico indicated that the *Drinking Water Protection Act* (2001) and Drinking Water Protection Regulation (B.C. Reg. 200/2003) require that all water systems meet minimum water treatment standards, monitoring type and frequency, and specific water quality standards. AuRico currently holds an active permit for three drinking water wells at the KUG Project and indicated that potential changes to groundwater quality related to the KUG Project TSF would be limited to the area within AuRico's mineral lease or mineral claims. According to AuRico, there are no other groundwater users within this area and no additional users could establish new wells without communication and knowledge of AuRico. The existing permit requires AuRico’s potable wells to be sampled every five years; however, AuRico currently samples the wells on a quarterly basis and will continue to do so. AuRico understands the responsibility to remain in compliance with existing permits and committed to providing a more detailed response of predicted exceedances of drinking water guidelines (including predicted COPC concentrations), engaging with Northern Health’s Environmental Health Officers regarding the KUG Project and discussing potential implications to the existing health permit.

To ensure Northern Health is provided with the information it requires to maintain a drinking water permit that is protective of human health for the KUG Project, EAO proposes an EAC condition requiring AuRico to provide details to Northern Health on baseline groundwater quality, predicted groundwater contaminant concentations, the

timeframe for when groundwater changes may occur, triggers for treatment and expected treatment options.

Particulate Matter Exposure

Both Northern Health and Health Canada raised concerns with respect to PM. Northern Health was concerned by the increases in predicted PM concentrations in the updated feasibility study. Considering the evidence that there is no safe threshold for effects due to PM, Northern Health recommended that AuRico manage PM levels to as low as feasible rather than its existing goal to manage PM using best management practices. Health Canada requested that AuRico conduct an assessment of the carcinogenic risk of exposure to $PM_{2.5}$ from diesel combustion.

AuRico developed an estimate of ILCR from $PM_{2.5}$ from diesel emissions, which were 2.25×10^{-7} and 7.80×10^{-7}, for construction and operations, respectively. These fall below the acceptable benchmark of 1.0×10^{-5} and AuRico therefore does not predict an unacceptable risk to human health from $PM_{2.5}$ resulting from diesel emissions. Health Canada had additional follow up questions about AuRico's calculations, but overall did not identify outstanding issues requiring resolution. EAO was satisfied with this analysis.

AuRico indicated that within its Air Quality Management Plan, it has committed to several management and mitigation measures to limit the levels of PM in the LSA and on access roads, which are consistent with standard management measures implemented at other mine facilities in BC. AuRico further predicted that ambient PM levels are expected to remain well below relevant established federal and provincial objectives for PM_{10} and $PM_{2.5}$. AuRico is required to comply with authorizations issued for the KUG Project and applicable regulations, including a MA permit requiring compliance with the Mining Code.

Northern Health remained concerned about the potential for increases in PM levels from the KUG Project to result in an increase in health risks. They did not concur with the conclusion of no residual effects on human health from the KUG Project. However, EAO considers AuRico's analysis and conclusions regarding PM exposure to be adequate for the purposes of the EA and consistent with guidance from Health Canada. In light of Northern Health's concerns and the potential health impacts should AuRico's predictions note be realized, EAO is proposing an EAC condition for an Air Quality Management Plan with mitigation measures to reduce PM levels. With the implementation of this plan, the requirements of the existing legislation and considering the modeled estimates of ILCR from $PM_{2.5}$, EAO is satisfied that exposure to humans from KUG Project PM would be minimized.

Metals in Dust

Northern Health raised concerns about the exposure of workers to metals bound to dust (PM) and the lack of detail AuRico provided to assess this health risk. Northern Health inquired how the updated feasibility study, in which increases in PM concentration are predicted, would affect the assessment of metals exposure. Northern Health recommended that AuRico implement one or more of the following measures:

- recalculate predictions for metals bound to PM_{10} at the camp and compare values to relevant air quality guidelines;
- monitor metals in dust at the camp as part of the Air Quality Management Plan; and
- implement proactive measures to manage metals in dust including indoor HEPA air filtration.

AuRico re-calculated the KUG Project-related metals concentrations bound to PM_{10} and compared estimates to air quality guidelines. The only metal predicted to exceed guidelines was Cr, as was also predicted in the original calculations. AuRico predicted that concentrations of hexavalent Cr bound to 24-hour PM_{10} during operations would increase from 0.000372 $\mu g/m^3$ to 0.000483 $\mu g/m^3$ following the increase in predicted PM levels (the Ontario 24-hour AAQC is 0.00035 $\mu g/m^3$ for hexavalent Cr This estimate assumes that all of the Cr bound to PM_{10} is present as hexavalent Cr, which is an unrealistic conservative assumption.

Following the receipt of these additional calculations, Northern Health remained concerned about the health risks to off-duty workers from metals in dust, including hexavalent Cr. They indicated that the annual Ontario AAQC for hexavalent Cr in PM_{10} is 0.00007 ug/m^3. Comparing total Cr to the hexavalent Cr objective may indeed be conservative. However, the modelled total Cr concentration in PM_{10} (0.000483 ug/ m^3) is above both the 24-hour and annual objectives for hexavalent Cr. Northern Health emphasized that even if hexavalent Cr only constitutes a portion of total Cr in dust, it is possible that the hexavalent Cr concentration in PM_{10} will exceed the objectives for hexavalent Cr. Northern Health reiterated their recommendation for monitoring and additional mitigation, if levels are observed to exceed relevant criteria. Considering these concerns and to confirm AuRico's predictions that levels of metals in dust do not exceed health criteria, EAO is proposing an EAC for an Air Quality Management Plan, which would include a provision requiring metals in fugitive dust to be monitored at human health receptor locations, including the camp and mitigation to address any effects identified by a QP. This plan would be developed in consultation with ENV, MEM, Northern Health and Aboriginal groups and could include a provision that would require total Cr to be monitored and compared to relevant standards for hexavalent Cr.

If exceedances were observed, then monitoring for hexavalent Cr could be conducted.

EAO notes AuRico will require a MA Permit authorizing construction and operation of the mine and an EMA Permit authorizing air emissions from the ore processing facilities. Terms and conditions of the permits would specify any monitoring requirements, such as dustfall monitoring. EAO is not aware of existing applicable regulations to manage metals in dust at the camp for off-duty workers.

Consideration of Indoor Air Quality

Northern Health inquired why AuRico did not assess the potential for workers to track dust from the mine site into buildings on clothing and shoes potentially impacting the health of workers and camp staff through the inhalation of contaminated dust. Northern Health further recommended HEPA air filtration for indoor environments.

AuRico responded that a mine dry will be located near the portals to the underground mine area. Workers coming off-shift will change out of their work clothing and footwear at this location before being transported back to the camp area. Thus, dust from clothing impacting interior air quality is not considered to be a pathway for air quality effects on workers or camp staff. In addition, AuRico predicts that dust levels outdoors will be higher than those indoors since building structures limit the exposure to air pollutants. The outdoor levels of air pollutants (including metals bound to PM) were assessed in the Application in Chapter 18. It was assumed that off-duty workers would be exposed to these concentrations during all their off-duty hours and that the concentrations indoors would be the same as the concentrations outdoors. The assessment determined that only Cr bound to PM_{10} exceeded applicable criteria (see discussion above). AuRico was of the view that indoor HEPA air filtration was not required considering that health effects were not predicted.

Northern Health was satisfied with this proposed mitigation but stood by their recommendation for HEPA air filtration. EAO notes that the Mining Code includes a requirement that underground mines have facilities for employees to wash and shower and to change and store their work clothing. Considering these requirements as well as the monitoring requirements of the Air Quality Management Plan, EAO is satisfied that the KUG Project would not have residual effects on health from indoor air.

Exposure to COPCs in Country Foods

Health Canada raised concerns regarding human exposure to COPCs from country foods, noting that a limited number of country foods were included and also that the modeled level of contaminants in country foods (at both baseline and project-related) were lower than those measured in the BC FNFNES. Health Canada recommended

that AuRico incorporate the BC FNFNES data into its assessment, where applicable, and provide further detail on the difference in values between AuRico's and the BC FNFNES values.

Health Canada also requested details on how food (and water) consumption advisories would be implemented should they become necessary. EAO notes that Northern Health, as the regional health authority (specifically the Medical Health Officer for the Health Service Delivery Area (HSDA) or the Chief Medical Health Officer if multiple HSDAs are involved) has the legal authority to issue (and recede) drinking water and country food advisories on non-reserve land. This would be completed by Northern Health in close collaboration with other agencies, including ENV, Ministry of Health, BC Centre for Disease Control and First Nations Health Authority.

AuRico recalculated TEDE and associated HQs using a larger number of country foods, resulting in the following additional COPCs having HQs >0.2: As, B, Se and TI for toddlers; and B, Cr, MeHg (in general and sensitive populations), Se and TI for adults. HQs were similar in baseline, construction and operation phases. In addition, using the difference between the measured values from the BC FNFNES and AuRico's original modeled estimates, AuRico calculated a calibration factor and applied this factor to its original estimates of tissue concentrations. While tissue concentrations were much higher in some cases than those used in the HQ calculations, they were similar for all project phases. From these calculations, AuRico indicated that the effect of the KUG Project on COPC exposure from country foods is expected to be negligible. Further, AuRico indicated that any risks identified to human health from country foods are due to existing conditions and AuRico is not responsible for managing or mitigating these risks.

Health Canada was not satisfied with these calculations, noting specifically that moose liver and kidney were not adequately included in the analyses, and that when COPCs are present above acceptable thresholds at baseline, effective mitigation should be considered for any project-related increase, however incremental. Health Canada therefore recommended that AuRico monitor the levels of COPCs in environmental media (air, soil, water, sediment) to confirm its model predictions of a negligible impact to the levels of COPCs. If monitoring results indicate an increase in COPCs in environmental media, Health Canada recommends that traditional foods are subsequently monitored for COPC concentrations as well. Monitoring programs should be developed in consultation with TKN and local health authorities, taking into account the health concerns expressed by these groups, and be undertaken at intervals that would allow for timely responses to protect human health in the event any risks are identified.

Considering the information presented by AuRico on mitigation planned to prevent the discharge of COPCs in to the environment, EAO is of the view that impacts to human

health as a result of consuming drinking water or country foods and inhaling air affected by the KUG Project are unlikely. However, EAO recommends a follow-up program including monitoring to verify AuRico's predictions in the EA and track any potential increases in COPC concentrations in the environment and inform additional mitigation, if necessary, in order to satisfy the requirements of CEAA 2012 with respect to avoiding adverse environmental effects of the KUG Project on Aboriginal health.

Conservative Estimates within the HHRA

Health Canada commented that the HRRA does not truly reflect a worst-case or most conservative scenario as AuRico suggests since many exposure estimates were based on median or 95th percentile upper confidence limit for the mean environmental COPC concentrations rather than the 95th percentile or maximum value. Health Canada recommended that AuRico explicitly show which estimates reflect worst case scenarios and which reflect mean or median scenarios. As noted above, Health Canada suggested that when baseline health risks exceed thresholds, any increase in risk as a result of the KUG Project necessitates mitigation to ensure the protection of human health. Northern Health was also concerned about the statistical methodology used when the sample size and quality of the data were limited and recommended that Health Canada guidance for HHRA be followed.

AuRico provided the information requested by Health Canada, which shows that 95th percentile predicted concentrations were used for surface water under all scenarios and fish under the construction and operations phases. Median concentrations were used for soil and vegetation plus worst-case dustfall (and root uptake, for vegetation) for construction and operations. AuRico pointed to the conservative assumptions used in the assessment listed below and indicated that these considerations combined with the worst-case estimates of surface water, dustfall and root uptake, provide for a conservative estimate of overall human health risk associated with the KUG Project.

- Adults and toddlers are exposed 24 hours per day, 7 days per week, and 52 weeks per year (even though there are no permanent or full-time residents within the Human Health LSA).
- 100% of the country foods consumed were harvested from the Human Health RSA.
- Country food species spend 100% of their time in the Human Health RSA.
- 100% of the COPC present in country foods were bioavailable.
- Serving sizes of country foods were based on the 95th percentile of values obtained from 24-hour recall surveys from First Nations country foods consumers across BC (Chan et al. 2011).

- Toddlers ranging from six months to four years old consumed food at a rate of 50% of an adult consumption frequency.
- Safety factors were applied to the toxicity benchmarks for human health.
- US EPA methodology for predicting soil and vegetation concentrations (US EPA 2005) assumes there is no loss of metals from soil due to weathering, leaching, or burial. Adopting this methodology leads to overestimates of metal concentrations in soil, vegetation, and ultimately country foods.

EAO is satisfied that AuRico's HHRA was appropriately conservative. In addition, the environmental COPC follow-up program proposed above will serve as a means to assess the accuracy of AuRico's predictions and provide an additional level of safety against potential Aboriginal health impacts from the KUG Project, as required under CEAA 2012.

Other Concerns

Northern Health raised a number of other issues that they did not consider to be satisfactorily addressed by AuRico. These issues include:

- socio-economic determinants of health
- specific COPCs included in the assessment;
- terrestrial wildlife species included in the assessment of country foods;
- exclusion of radiological exposures from the assessment;
- definition of baseline (including the fact that off-duty workers are exposed to elevated—compared to many residential areas of BC—levels of COPCs at the camp but this exposure is considered baseline because it is pre-existing in the LSA and not a result of the KUG Project); and
- additive exposure from threshold COPCs.

EAO acknowledges that a more detailed analysis including one or more of the issues above would be informative and provide greater confidence in the EA predictions. However, in EAO's view, the baseline and project effects assessments met the requirements of the AIR and were commensurate with the potential health effects. EAO notes that social issues are discussed in section 4 and that the COPCs were selected from an initial screening of 38 chemicals for their potential to bioaccumulate or exceed soil, drinking water or fish tissue guidelines. Further, the terrestrial wildlife species used for the country foods assessment were based on the best available data on First Nations consumption rates of country foods. An elevation in radiological exposures is not predicted at the KUG Project. As discussed above and concluded below, EAO is satisfied that the KUG Project would not have adverse residual health effects because

of the proposed mitigations to limit the release of COPCs into the environment and the proposed EAC conditions. In EAO's view, further analysis and consideration of the listed issues above would not alter this conclusion. Further details on these comments and AuRico's responses are included in the working group issues tracking table.

5.1.3 Analysis and Conclusions

5.1.3.1 *Characterization of Residual Effects*

EAO did not identify any residual effects to human health as a result of the KUG Project.

5.1.3.2 *C*onclusions

Based on the combination of existing legislation, proposed KUG Project design measures, mitigation measures, and having regard to the conditions identified in the TOC including a condition for an Air Quality Management Plan (which would become legally binding as a condition of an EAC), EAO is satisfied that the KUG Project would not have residual effects on human health.

6. Assessment of Heritage Effects

6.1.1 Background

The KUG Project is within the traditional territories of TLFN and TKD, and immediately upstream of KwN territory (collectively known as TKN). In addition, Gitxsan Wilp Nii Kyap has a traditional territory that overlaps the RSA. The KUG Project is within the West Moberly First Nation's (WMFN) preferred territory, in the Treaty 8 disputed area (see Part C for additional information). MNBC asserts rights and traditional uses over the entire province of BC; however the Application states that current Métis land and resource use occurs primarily outside of the RSA. The RSA contains 38 known archaeological sites attributed to ancestral First Nation use of the area and five historic sites. In this report, archaeological sites are those designated as Provincial heritage sites under the HCA, while historic sites are undesignated but still may be of historic value to BC, a community or an aboriginal people. In this section, EAO addresses potential impacts of the KUG Project to physical heritage resources. Other types of impacts or sites (e.g., sacred areas) are addressed in section 10 and Part C of this report.

6.1.1.1 *Description of Valued Components*

The VCs included in the assessment of heritage effects were physical heritage resources (including any structure, site or thing of historical, archaeological or architectural significance) and paleontological resources. These VCs were included due to requirements regarding heritage effects under the Act, the HCA and CEAA 2012. In addition, concerns were raised about potential impacts of the KUG Project on archaeological sites and paleontological resources by Aboriginal groups during consultations.

6.1.1.2 *Study Areas*

AuRico defined the LSA to include the KUG Project footprint plus a 150-m buffer (Application, Figure 19.3-1). In consultation with TKN communities, AuRico determined the RSA boundary to include Thutade Lake and Amazay Lake to the west; Moose Valley including Sustut River and Sustut Lake to the south; Toodoggone River and ToodoggoneLake to the north; and Flammeau Creek to the west (Application, Figure 19.3-2). The area was selected to include important geographic and cultural elements and reflects significant shared value and land use of TKN. In particular, Thutade and Amazay lakes are considered sacred areas, historically and currently, and are used for vision quests and spiritual journeys, in addition to hunting and fishing.

6.1.1.3 *Proponent's Assessment*

To assess effects, the following indicators were considered for the heritage VCs:

- known archaeological sites;
- as-yet-unknown archaeological sites;
- sites with architectural or historical significance; and
- paleontological sites.

These indicators could be directly impacted by KUG Project activities such as the movement, excavation or disturbance of soil during the construction and operations phase and indirectly impacted by increased human presence during the active phases of the KUG Project. Of the known archaeological sites in the RSA (Application, Table 19.4-1), one site may be affected by upgrades to the exploration road (HgSq-15). This site is a small lithic scatter consisting of three basalt flakes that was previously disturbed by the existing exploration roads. The site was identified during field work conducted for the KUG Project Archaeological Impact Assessment (AIA) in 2014 and appeared at that time to have been exposed by recent road grading activities. The remainder of the known sites are outside the LSA and would not be expected to be impacted directly or indirectly by the KUG Project. No paleontological sites or sites of architectural or historical significance were identified within the LSA; however, the KUG Project could impact as-yet unknown archaeological sites within the LSA.

Mitigation Measures

To address potential effects to the archaeological site within the LSA, HqSq-15, AuRico would submit an application to the Archaeology Branch for a Section 12 Site Alteration Permit prior to the start of construction and the conditions of the permit would be followed. Since this site has been disturbed by the existing road, it may qualify as a legacy site requiring no further archaeological management measures.

If additional as-yet-unknown archaeological sites are discovered during the lifetime of the KUG Project, they would be subject to the general management and mitigation measures described below.

Heritage Chance Find Procedure

- This procedure includes a stop work order to minimize impacts to the site and reporting to the appropriate authorities and Aboriginal groups.

General Mitigation Measures for Archaeological Sites Identified during AIAs or Chance Finds

Measures include, for example, the specification that:

- archaeological sites within 0-50 m of ground altering activities would be marked as ‘no work zones’ and would be flagged or temporarily fenced;
- archaeological sites within 50-150 m of project components would be marked as ‘no work zones’ and monitored for indirect effects;
- If impacts are anticipated, or observed, then additional mitigation may be implemented which may include systematic data recovery; and
- protected areas would be monitored.

Site orientation and training of construction personnel on HCA requirements would be conducted to promote staff awareness of the procedures for responding and reporting new sites.

Several areas of the KUG Project were not assessed during the AIA for the KUG Project. These include the Exhaust Ventilation Access Road, Borrow 10 Expansion, East Pit Quarry Additional Development Area, Diversion Ditches and Attichika Discharge Pipeline. These areas will require an AIA prior to development, which is anticipated to be undertaken in 2017.

A Heritage Management Plan, describing the steps that would be taken prior to upgrading the exploration road where HgSq-15 is located, as well as the mitigation procedures for additional sites, should they be discovered, is provided in Section 24.9 of the Application. An Archaeological Management and Impact Mitigation Plan is a requirement of a MA permit application.

6.1.1.4 *Other Relevant Projects*

Within the RSA, the former KS open pit mine, whose footprint overlaps with much of the LSA, and other activities such as mineral exploration could potentially have a cumulative effect with KUG Project on heritage resources. The archaeological site HgSq-15 was previously impacted by KS development. However, this site has already been disturbed, AuRico considered the effects from KS to be the baseline for further effects from KUG Project and no residual heritage effects are identified for KUG Project. Therefore, other projects are not expected to be relevant to heritage effects from KUG Project.

6.1.2 Discussion of Issues

No comments were made regarding heritage effects by the Working Group.

HRFN raised the issue that they were not engaged in the development of the heritage effects assessment and more consultation was required to identify culturally or spiritually significant sites within the RSA or LSA of the KUG Project. AuRico responded that its level of engagement with HRFN was based on the guidance provided by the BC EAO and the Agency regarding consultation with Aboriginal groups listed on Schedule C of the Section 11 Order. AuRico engaged with HRFN on a number of occasions including: introducing them to the KUG Project and proposing a consultation approach, providing a summary report on publicly-available information regarding HRFN use of the lands, and responding to specific technical comments from HRFN on potential impacts to the Peace River Watershed. AuRico responded that it was available for discussion of the KUG Project and its potential impacts with the HRFN and community and would review any information regarding culturally or spiritually significant sites within the RSA or LSA if provided by HRFN. EAO sought feedback from HRFN on the adequacy of AuRico's responses to their comments. HRFN did not respond. EAO is satisfied that the requirements identified in the Section 11 Order have been met. Further information on HRFN and EAO and AuRico's consultation with HRFN is provided in Part C of this report.

6.1.3 Analysis and Conclusions

6.1.3.1 *Characterization of Residual Effects*

EAO is satisfied that no residual effects are expected to heritage resources, including as-yet-unknown archaeological sites, from the KUG Project after mitigation. AuRico has provided a Heritage Resources Management Plan describing the course of action that would be taken prior to upgrading the exploration road where HgSq-15 is located, as well as the mitigation procedures for additional sites, should they be discovered. EAO is satisfied with the procedures, mitigations and other measures proposed in the plan and has considered the requirements of the HCA and the MA.

6.1.3.2 *Conclusions*

Considering the above analysis and having regard to the requirements of the HCA and the MA permit application requirements, which include an Archaeological Management and Impact Mitigation Plan, EAO is of the view that the KUG Project would not have residual effects on physical heritage, archaeological and paleontological resources.

7. Accidents and Malfunctions

7.1.1 Background

During construction and operation of the KUG Project, unplanned events could occur that would result in effects to surface water quality, terrain and soils, terrestrial ecology, fish and aquatic habitat, wildlife, human health and CULRTP. Unplanned events could arise from accidents or malfunctions associated with proposed KUG Project activities or from environmental events or processes, which could have adverse effects on the KUG Project.

Potential unplanned events were assessed in the Application using a risk-based approach. AuRico considered worst-case scenarios for each of the potential unplanned events and assessed the risk of each according to the likelihood and potential consequence or severity of the scenario.

As described in Part A of this report, AuRico evaluated alternative means of implementing and carrying out various aspects of the KUG Project including alternate options for tailings and waste rock management. AuRico identified the proposed design of the KUG Project TSF as the preferred option considering technical merit and implications for environmental and human environment VCs. EAO is satisfied that the Proponent has reasonably considered the alternatives for storing tailings with a regard to economic and technical feasibility, and potential impacts on VCs and that the proposed design represents the application of BAT for both physical and chemical stability of the tailings and waste rock generated. EAO recognized this evaluation when considering the risk of a potential accident or malfunction of the KUG Project TSF.

EAO also notes that that, following from the Independent Panel recommendations on the TSF breach at Mount Polley (see Part A for further details), Part 10 of the Mining Code was updated on July 20, 2016 to include design standards for TSFs that are tailored to the particular conditions encountered in BC and emphasize protecting the public and workers. These include TSF design requirements for the steepness of downstream slopes, the minimum static factor of safety and new seismic and flood design criteria. Other updates include new operations criteria for TSFs, requiring water balance and water management plans for TSFs and requiring mines with TSFs to establish Independent Tailings Review Boards.

The Association of Professional Engineers and Geoscientists of BC (APEGBC) has also completed the new professional practice guidelines for site characterization for tailings dams in BC. The new guidelines directly respond to the independent Panel's recommendation that APEGBC develop guidelines that would lead to improved site

characterization for tailings dams with respect to the geological, geomorphological, hydrogeological and seismic-tectonic characteristics.

Details on the effects and significance of a KUG Project TSF dam breach (in its unlikely event) are described below along with other potential accidents and malfunctions of the KUG Project.

7.1.1.1 *Description of VCs*

Interactions between risk events and VCs for all subject areas were assessed. The full list of VCs is available in the Application, Table 22.7.1.

7.1.1.2 *Study Areas*

Spatial boundaries for each VC are as described previously in the Assessment Report.

7.1.1.3 *Proponent's Assessment*

AuRico used a Failure Mode Effects Analysis (FMEA) to identify the risk level for 167 potential events within the following categories:

- leak/spill of hazardous substances stored on site;
- leak/spill during road, air or water transport;
- release of contaminant from ore/waste stockpile;
- breach/failure of tailings dam or other containment structure;
- discharge of off-specification effluent from treatment plant;
- sediment release into watercourse, erosion;
- construction or operation of underground facilities;
- fires or explosions;
- waste rock dump or stockpile failure;
- inrush/inundation to underground mine;
- air blast in underground mine;
- fly rock from blasting; and
- ground instability or failure.

The FMEA is a qualitative analysis of the potential failure modes, the probability of those events, effects of the events and how the practices of the activity could be modified or redesigned to eliminate or reduce the event likelihood of consequence of the effect. Of the 167 potential events, 156 were considered to be of low environmental risks. Further details are available on these low-risk events in the Application, Section 22.6 and the Application Appendix 22-A. The remaining events were found to be

moderate or high risk and fell within the following four categories:

- leak/spill of hazardous substances stored on site;
- leak/spill during road, air or water transport;
- fires or explosions; and
- breach/failure of tailings dam or other contaminated structure.

These events as well as their effects on VCs are described in the subsequent sections. Those VCs for which a potential for moderate or significant adverse effects were identified were carried forward in the assessment to the discussion of residual effects below.

Failure of Dewatering Pipeline

Within the category of on-site leaks and spills, AuRico predicted only one event—a failure of the underground dewatering pipeline—to be of moderate risk level (unlikely with moderate consequences). AuRico predicted all other events were to be low risk. Such a failure could result in untreated water entering the receiving environment and impacting soil quality and quantity, water quality, fish, aquatic ecosystems, wetlands, western toad and human health (via the contamination of water and country foods). The most significant of these effects would be to fish and aquatic life. A rupture could occur in three possible areas: south of the tunnel entrance with resulting untreated water flowing downslope of the south tunnel entrance into the yellow-listed wetlands and the KS Western Diversion Ditch; in the area previously disturbed by KS with resulting flows along the roadside ditch and into the KUG Project TSF; within the access tunnel; and north of the tunnel entrance with flows north of the tunnel entrance to water management facilities in the Kemess Lake valley.

AuRico expects water in the pipe to exceed acute toxicity guidelines for numerous COPCs and, therefore, could harm terrestrial and aquatic receiving environments. Surface water quality could also be impacted by the influx of untreated water and sediment resulting from overland flow of liquid. The magnitude of the effect would depend on the location of the rupture, distance to water bodies and amount of dilution (for aquatic systems).

Leaks and Spills during Transport

AuRico predicted four events involving leaks and spills during transport to be of moderate risk (unlikely with moderate consequences). AuRico predicted all other events predicted to be low risk. The moderate risk events include the accidental release of process reagents, waste, concentrate and fuel or propane during transport to and from

the mine site. AuRico assessed the direct spill of an entire load of each of these compounds as a worst-case scenario. This event would potentially affect water quality, soil quality and quantity, wetlands, fish and other aquatic organisms and human health effects. AuRico expects effects to wetlands and aquatic organisms to be most significant, with possible minor effects to wildlife and terrestrial environments.

Fires or Explosions

AuRico considered four events causing fire or explosion to be of moderate risk (unlikely with moderate consequences). These include a fire or explosion resulting from the crash of a truck carrying process reagents, waste, concentrate or fuel. AuRico considered fires resulting from other sources and identified them as being of low risk. An explosion of a fuel truck was assessed as a worst-case scenario. This event would potentially have moderate adverse effects on forested ecosystems and minor effects on other types of habitat and human health. Effects would depend on the timing of the event. In periods of high wildfire danger, the fire could spread further and more quickly resulting in a larger burned area before it is extinguished.

Breach/Failure of Tailings Dam or Other Containment Structure

AuRico predicted two events within this category to be of high environmental risk (rare with severe consequences) while all others were predicted to be low risk. A failure of the East Dam or an overtopping of the East Dam or pit wall could result in significant adverse effects on numerous VCs including those for water quality, terrain and soils, terrestrial ecology, fish and aquatic habitat, wildlife and effects of changes to the land on Aboriginal peoples (the CEAA 2012 section (5)(1)(c) VCs). A failure of the East Dam would have more severe effects than an overtopping of the East Dam and is therefore considered as a worst-case scenario. Under the scenario of a catastrophic East Dam Failure, a large volume of tailings and supernatant water would flow downstream into Kemess Creek. Although a dam breach and inundation study has not yet been completed for the KUG Project East Dam, a dam breach analysis for the KS TSF suggests that effects from an East Dam failure would extend into Attichika creek and the mouth of Attichika Creek in Thutade Lake. These effects could include:

- exceedances of water and sediment quality guidelines;
- alteration of stream morphology;
- deposition of COPCs, tailings and debris deposited into aquatic habitat;
- exposure of PAG material;
- damage to wetlands and harvestable plants;
- mortality of fish and destruction of fish habitat;
- direct and indirect mortality of western toad; and

- alteration of lands that are of high importance, culturally and spiritually to TKN.

Mitigation Measures

Details and procedures to avoid, respond to and mitigate accidents and malfunctions are provided within the following EMPs proposed by AuRico:

- ERP;
- Environmental Emergency, Spill and Hazardous Materials Plan;
- Mine Waste, Tailings, and ML/ARD Management Plan; and
- Air Quality Management Plan.

Details on these plans are available in Chapter 24 of the Application. In addition to describing emergency avoidance and response measures, EMPs contain monitoring and reporting provisions that would support adaptive management by requiring the collection of data on the efficacy of the plans and informing any modifications required to ensure optimal effectiveness of mitigation measures. For example, in the event of a spill of a hazardous material, AuRico would identify an enhanced soil and/or aquatic monitoring program. This program would include an increase in monitoring frequency or change in parameters to inform on the success of the spill response mitigations. A subsequent incident investigation would determine if changes to the plans are required to adequately address root causes or potential shortcomings.

Requirements for these EMPs would be addressed through MA permit application requirements and EAC conditions, as described in section 9 of this report. In addition to the EMPs, key design and mitigation measures for moderate and high risk events are listed below:

Failure of Dewatering Pipeline

- routing the pipeline along the conveyor and protecting it by a safety berm;
- regular maintenance and inspection of facilities and pipeline, including pressure loss monitoring; and
- spill response planning to potentially enable diversion of untreated water to less sensitive areas and preparation of cleanup materials.

Leaks and Spills during Transport

- secure transport conditions that would prevent spills even in the event of a vehicle accident;
- non-compatible materials will be transported in separate shipments;
- drivers, contractors and employees responsible for transporting products will be adequately trained for spill response, containment and communication;

- spill response planning to allow for prompt containment, recovery and remediation; and
- supplier/contractor management plans for off-site transport.

Fires or Explosions

- supplier/contractor management plans for off-site transport;
- firefighting capacity and equipment will be appropriate for the KUG Project;
- containers will be appropriately secured and labelled; and
- drivers and vehicles will comply with requirements of legislation governing the transport of dangerous goods.

East Dam Failure or East Dam or Pit Wall Overtopping

- design of pit wall to prevent overtopping;
- robust dam design to applicable standards with a high factor of safety and downstream supported by compacted rock fill;
- geotechnical assessment of dam foundation (rocks and sediments) and removal of any weak material unsuitable for overloading by the dam and tailings;
- dam design includes abundant freeboard, diversions and closure spillway; and
- instrumentation to monitor the dam and regular visual inspection to check for any signs of weakness or damage.

7.1.1.4 *Other Relevant Projects*

EAO has not considered other projects in the assessment of effects from accidents and malfunction, as described in section 7.1.3.2 below.

7.1.2 Discussion of Issues

During Application review, EAO received comments relating to accidents and malfunctions from TKN and Northern Health. Comments received regarding failure of the decline plugs are discussed in Section 3.3 in the context of potential water quality effects.

Below, EAO has summarized the key EA issues that required resolution as part of the Application review phase. The issues tracking tables include all comments received for comments related to accidents and malfunctions, including those that were for clarification.

Key issues include:

- KUG Project TSF Issues (including potential failure of the KUG Project TSF East Dam, the tailings alternatives assessment and extended beach);
- the analysis methodology;
- assessment of decline plug failure; and
- engagement with TKN and conditions for EMPs.

KUG Project TSF Issues

Potential Failure of KUG Project TSF East Dam

TKN raised concerns that residual effects to wildlife would be significant in the event of a KUG Project TSF East Dam failure due to the presence of moderate to high suitability habitat for moose, grizzly bear and potentially caribou downstream of the dam in Kemess Creek and Attichika Creek. In response, AuRico acknowledged that the assessment of significance was subjective but that changing the rating would not influence planning or KUG Project design. EAO agreed with TKN's assessment of effects to wildlife from a potential KUG Project TSF East Dam failure and this rating is reflected in EAO's significance analysis in Table 29 below.

Tailings Alternatives Assessment

As discussed in Part A of this report, in accordance with EAO's requirements, AuRico conducted a tailings alternatives assessment with respect to options for tailings management, considering technology, siting and water balance. TKN recommended that AuRico further investigate approaches that could result in feasible thickened tailings such that no East Dam would be required. TKN noted that from a longer-term management perspective this option would be preferable to the East Dam option because it would eliminate the need for ongoing maintenance of the dam in the closure and post-closure stages. TKN stated that they felt the thickened tailings option in the alternative assessment was eliminated without adequate review, especially because of the significant long-term benefits.

AuRico explained that the density of tailings that would be required for the KUG Project to eliminate the need for the East Dam would be over 85% solids content by weight. AuRico noted that this is at the upper limit of paste technology under ideal conditions and normally only practical through filtering of tailings (also known as dry stacking). To use this for the KUG Project would first require full dewatering of the pit, which AuRico stated would not be environmentally or geotechnically feasible within the current KUG Project timeline as the high discharge rate could cause negative effects to the receiving environment and possibly lead to instability of the pit walls. AuRico explained that the additional years of dewatering and treatment in addition to the already planned

construction water draw down period would not be feasible from a project timeline or economic perspective. AuRico also pointed to economic concerns associated with thickened-filtered tailings from a capital and operational expenditures perspective, such that it could severely impact project economics.

As noted in Part A of this report, EAO found AuRico's tailings alternative assessment to meet the requirements set out by EAO in its March 19, 2015 letter. EAO is satisfied that AuRico has reasonably considered the alternatives for tailings and waste rock management. EAO also notes that economic and technical aspects of tailings management alternatives were some of the factors AuRico was required to consider so finds AuRico's response to this particular request regarding thickened tailings to be satisfactory.

Extended Beach

The current KUG Project proposal is to have a 300 m beach separating the KUG Project TSF pond from the East Dam. The tailing alternative assessment presented the possibility of an extended 800 m wide tailings beach to improve the stability of the dam and reduce the possibility for erosion of tailings if the East Dam were to fail, subject to the completion of a feasibility study.

TKN proposed a condition that AuRico should complete a feasibility study for the extended beach and if it is deemed feasible to incorporate the extended beach into the mine design prior to, or during the MA permitting stage.

AuRico noted that the geochemical assessment of the KUG Project tailings was still ongoing to determine if the tailings beach could be extended. The testing would determine the amount of sand that could be generated as suitable sub-aerial beach material during the final years of mine operations, which would then inform the final beach configuration options. AuRico also noted that the potential 800 m beach would only be achieved at the end of the operating phase with the width during operations being lower and varying.

To address these concerns, and to support implementation of BAT as recommended by the Independent Panel, EAO is proposing an EAC condition that would require AuRico to complete the feasibility study and provide the results to TKN and MEM. EAO is also proposing an EAC condition requiring AuRico to establish an Environmental Monitoring Committee and invite participation from TKN and government agencies to facilitate information sharing and provide advice to AuRico on ongoing development of the KUG Project and mitigation measures. This Environmental Monitoring Committee would discuss various topics, one of which would be the feasibility of the extended beach.

Analysis Methodology

TKN questioned the extent to which the FMEA relied on professional judgement as well as the lack of detailed analysis and mitigations for events with low risk ratings and suggested that references to supporting scientific evidence or experience with other mines would be necessary to strengthen the analysis. TKN further recommended that AuRico develop detailed standard operating procedures (SOP) and management plans that identify how events identified as “Likely to Occur with Low Environmental Consequence” or “Rare Occurrence with Moderate Environmental Consequence” in Appendix 22-A of the Application will be mitigated and managed to allow for these events to be considered “low environmental risk” events TKN stated this should be a condition of the EAC and TKN should be granted a meaningful opportunity to be involved in developing these procedures and plans.

AuRico responded that the complexity of the engineered systems interacting with natural systems makes it very challenging to precisely mathematically predict the potential for failure events. AuRico indicated that relying on the judgement or experience of QPs to provide their best estimates of the consequence and likelihood of risk events is considered the norm for many industrial, engineering and social management systems using FMEA and that the FMEA process for the KUG Project included experts who had first-hand experience with KS, which informed their assessment. AuRico indicated that events with negligible or low environmental consequences or rare likelihood that are low risk do not require the development of additional mitigation measures, beyond what was considered in the FMEA.

Considering these concerns, and the lack of clear information on how the lower risk events will be addressed, EAO is proposing an EAC condition for an Accidents and Malfunctions Administration Plan that would require AuRico to provide a plan to address how these low environmental risk events would be addressed by other ERPs or regulatory requirements; and if any events are not addressed by existing requirements, how AuRico would propose to address and mitigate potential effects from these events. In addition, these low environmental risk accidents would also be a topic of discussion in the above mentioned Environmental Monitoring Committee, which would be a required as an EAC condition.

Northern Health had concerns that the impact of accidents and malfunctions on human health was not adequately addressed in the assessment. Northern Health asked that the potential for injury in the event of an accident be considered and that an HHRA for accidents and malfunctions should be completed. AuRico indicated that assessing potential human health impacts quantitatively in a HHRA would be challenging due to the high levels of uncertainty and number of assumptions that would be required.

Therefore, AuRico assessed potential impacts to human health from accidents and malfunctions qualitatively as part of the FMEA and residual effects analysis.

Northern Health was not completely satisfied with this level of analysis and also expressed concern with the characterization of residual effects to human health from accidents. EAO is of the view that the characterization of residual effects to health from accidents and malfunctions is appropriate based on the rationale provided (details below in section 7.1.3) and the analysis methodology used by AuRico is adequate, given the nature of the accidents and malfunctions that were of moderate and high risk, the proposed mitigations and EMPs and the existing provincial and federal legislation in place to protect human health.

Engagement with TKN and conditions for EMPs

Communication regarding emergency planning and accidents

Northern Health recommended that AuRico develop an inventory of water users and a communication strategy to notify users in the event of a slope or dam failure.

TKN raised concerns that impacts to their interests were not given sufficient weight in the analysis of the significance of moderate risk events. For example, a spill of hazardous material into the aquatic environment might be cleaned up rapidly and fish may eventually re-populate the area, but impacts to TKN and their cultural wellbeing could be significant with a loss of fishing and cultural connection to the resource. In addition, TKN requested that they be provided with: meaningful opportunities to participate in the FMEA study and contingency planning; opportunity to participate in the preparation and implementation of EMPs and training and funding to participate in emergency response activities as EAC conditions.

In response, AuRico emphasized its commitment to ongoing communication and dialogue with TKN and indicated that TKN would be engaged in discussions on the potential impacts of risk events on values important to TKN via their participation on the Environmental Management Committee (note: the Environmental Management Committee is established by AuRico through the The Interim Measures Agreement (IMA) with TKN and the Environmental Monitoring Committee is proposed as a condition of the EAC). AuRico indicated that the Environmental Management Committee would meet continually through the period in which the MA permit is being prepared and at regularly scheduled intervals thereafter. AuRico also indicated that although it would be responsible for most aspects of emergency response, it is open to dialogue on topics such as TKN participation in the development of EMPs (and inclusion in the Impact Benefit Agreement). With regard to communication following a dam breach, AuRico responded that the ERP that would be further developed to support a

MA permit application would incorporate an effective communication strategy including the implementation of water advisories, as part of the emergency response to a dam breach.

EAO is of the view that any TLFN, TKD or KwN asserted Aboriginal title, rights, and interests within their respective traditional territories (Aboriginal title, rights, and interests of the TKN First Nations) in accordance with the Collaboration Agreement (CA; see section 11.4 for details) between the Province and the Carrier Sekani First Nations (CSFN), could be impacted in the short to medium term for most accidents and malfunctions and in the longer term for a dam breach. Further discussion of impacts to the Aboriginal title, rights, and interests of the TKN First Nations from the KUG Project is included in Part C of this report. EAO notes that TKN has various opportunities for engaging in discussion on risk events including the Environmental Management Committee, the Senior Implementation Committee and through other discussions with AuRico. EAO's policy is to involve First Nations in the preparation and implementation of EMPs that are conditions of an EAC. This will be reflected in the EAC conditions that relate to EMPs.

EAO notes that although AuRico is required to notify the Chief Inspector of Mines of TSF safety issues under the MA, and to report spills to a Provincial Emergency Program under the EMA, AuRico would not be required to directly notify First Nations, communities or other users of the potentially impacted area of an accident or malfunction at the KUG Project. EAO therefore proposes an EAC condition for an Accidents and Malfunctions Communications Plan to address how Aboriginal groups, communities and other users of the area would be notified in the event of an accident that could have environmental or health consequences off-site. The plan would include detail on which types of accidents require notification, the information to be included in the notification, the Aboriginal groups and other groups requiring notification and any opportunities for Aboriginal groups or other users of the area to assist in response to the accident or malfunction.

Northern Health and TKN indicated they were satisfied with this resolution of the issue.

Inclusion of hazardous materials inventory and post-remediation HHRA in EMPs

Northern Health recommended that the ERP and Environmental Emergency, Spill and Hazardous Materials Plan should be required as an EAC condition. They further recommended the following additions to the plans:

- information on the persistence and toxicity of hazardous materials on site and appropriate response procedures; and
- requirement for a HHRA in the event of a slope or dam failure or other accident that increases environmental concentrations of COPCs.

In response, AuRico indicated that these issues would be addressed in permitting. An inventory of all the hazardous materials on site would be prepared to supplement the Environmental Emergency, Spill and Hazardous Materials Plan to ensure that KUG Project personnel have all the necessary information for safe handling; and the ERP would also include a requirement for a post-remediation HHRA for severe accidents. While Northern Health was not completely satisfied with this response, EAO considers these issues to be adequately addressed by the MA permitting process and the EMPs that are required to accompany a MA application, as discussed in the section on Mitigation Measures above.

Post-spill recovery costs

Northern Health recommended that AuRico be required to commit to paying post-spill recovery and compensation costs and demonstrate its ability to cover these costs. They further recommended that this should be an addition to the ERP and Environmental Emergency, Spill and Hazardous Materials Plan. AuRico responded that financial commitments for the KUG Project would be required by MEM in the form of bonding during the MA permitting process.

EAO notes that it is the responsibility of the mine operator to ensure sufficient environmental liability insurance is held to meet the risk of accidents but that this type of insurance is not available for dam breaches. The EMA contains authority for spill response actions and cost recovery to require persons in possession or control of any polluting substance to prepare contingency plans and to implement those plans at their expense in the event of a spill. The EMA also provides for the recovery of costs should action to respond to a spill be declared by the Minister. The EMA was amended in May 2016 to proactively require potential polluters to pay into a spill preparedness and response organization. For additional information on this issue, please see the government response to the Auditor General's recommendation that the government review its security mechanisms for catastrophic events following Mount Polley[21]. In addition, AuRico is also addressing the potential for this event through its IBA with TKN.

Wildfire

TKN expressed concern that AuRico underestimated the risk of wildfire resulting from crashes or collisions of KUG Project vehicles along the ORAR to the environment. They indicated that large-scale wildfire with impacts to soil, water quality and wildlife could have substantial impacts. TKN expects that many of the fire mitigation measures

[21] Auditor General of BC. 2016. An Audit of Compliance and Enforcement of the Mining Sector. Available from: https://www.bcauditor.com/sites/default/files/publications/reports/OAGBC%20Mining%20Report%20FINAL.pdf

proposed by AuRico for the KUG Project (e.g., access to water hoses) would not be feasible along the ORAR. In addition, TKN wanted sub-contractors and suppliers employed by AuRico traveling along the ORAR to be held to the same standards as AuRico.

AuRico responded that fires caused by a KUG Project-related accident or malfunction were considered to be controllable given the rapid response and control measures planned. It indicated that all vehicles would be equipped with on-board fire-fighting capability. AuRico expects that suppression measures would be capable of limiting a fire to the area around the incident and preventing effects on most VCs.

Recognizing TKN's concerns, and given the requirements under the MA permitting would not cover the ORAR, EAO is proposing an EAC condition for an Accidents and Malfunctions Administration Plan that would address the risks of fire, as well as other accidents involving KUG Project vehicles along the ORAR. This plan would require AuRico to manage the risk of, monitor and report on accidents along the ORAR, regardless of whether AuRico or another company owns the vehicle or directly employs the driver.

7.1.3 Analysis and Conclusions

EAO's analysis of potential residual effects from accidents and malfunctions of the proposed KUG Project is presented below.

7.1.3.1 *Characterization of Residual Effects*

The FMEA analysis identified which events were of moderate or high risk; therefore, the characterization of residual effects focuses on the residual effects of individual accidents and malfunctions to VCs, assuming that the event has taken place. If any of the moderate or high risk events described above were to occur, EAO expects residual effects on certain VCs to occur. With the exception of a KUG Project TSF dam failure, however, EAO does not predict residual effects to be significant due to the short to medium term duration of events, the reversibility of the events, the resiliency of the environment and the mitigation measures proposed by AuRico. However, failure of the KUG Project TSF East Dam would affect surface hydrology, surface water quality, wetlands, fish and aquatic habitat, western toad, and CULRTP. In the rare event of a worst-case dam failure, these VCs would be expected to experience significant effects. Further details are provided on the effects to VCs for each of the moderate or high risk events in
Table 26 to Table 29 below. Unlike in other sections, EAO has presented context and resiliency separately. Both the resiliency of a VC as well as its ecological or cultural importance are particularly relevant to the ultimate significance of an accident. Because

these two factors often had different ratings for the accidents discussed, however, EAO evaluated them separately.

Table 26: Summary of Residual Effects for Failure of Dewatering Pipeline

Factor	Rating	VC	Rationale
Context	Low	Soil quantity and quality, aquatic organisms	Fish-bearing watercourses and wetlands that could be impacted by this event have some unique attributes resulting in high ecological context while other VCs are low or neutral.
	Neutral	Surface water quality and human health	
	High	Wetland ecosystems, western toad, fish and aquatic habitat	
Resiliency	Low	Surface water quality, soil quantity and quality	Water and soil quality are expected to have low resiliency. Soils in the affected area are susceptible to erosion and soils and water quality would be impacted by elevated metals contained in the pipeline. Resiliency of other VCs is considered moderate or high because they are expected to be able to recover after disturbances; some species may be adapted to frequent disturbance.
	Moderate	Wetland ecosystems and western toad	
	High	Fish and aquatic organisms and habitat, human health	
Magnitude	Moderate	Wetland ecosystems, fish, western toad, human health	Effects on ecosystems, fish, western toad and human health would be moderate due to their resiliency and the limited expected duration and area affected by such an event. The magnitude of effect on water and soil quality and quantity would be high because concentrations
	High	Surface water quality, soil quantity and quality, aquatic organisms and habitat	

Factor	Rating	VC	Rationale
			of metals would likely exceed soil and WQG. Aquatic habitat would also be impacted by changes in pH and sediment loading could limit the availability of light and oxygen for primary production, periphyton and benthic invertebrates.
Extent	Local	Soil quality and quantity and wetlands	The geographic extent of certain effects would be limited to areas proximal to the pipeline failure point while the geographic extent of other effects would be landscape-wide, as contaminated water flowed downstream with potential impacts on water quality, aquatic organisms, western toad and human health.
	Landscape	Water quality, fish and aquatic organisms and habitat, western toad and human health	
Duration	Short (1-5 years)	Water quality, wetlands, fish and aquatic organisms and habitat, human health	The duration of the majority of effects would be expected to be short due to the limited anticipated duration of the pipeline leak and assimilative capacity of the environment; however, medium-term changes to soil metal content and on chronic toxic metal effects on western toad could result.
	Medium (6-25 years)	Soil quality and quantity and western toad	
Reversibility	Reversible medium term	Surface water quality, soil quality and quantity, wetland ecosystems, aquatic organisms and habitat, western toad and human health	All the effects resulting from a failure of the dewatering pipeline are expected to be reversible in the medium term. With effective and timely spill response procedures, changes to soil

Factor	Rating	VC	Rationale
			quantity and quality and water quality would be reversible and the resulting effects to biota, human health and ecosystems would resolve.
Frequency	Continuous	Surface water quality, soil quality and quantity, wetland ecosystems, aquatic organisms and habitat and western toad	Effects to the environment from contaminated water would be expected to be continuous until the spill was resolved and remediated or assimilated; however effects to human health would depend on human exposure (if people were present in the affected area) and would therefore be sporadic.
	Sporadic	Human health	
Likelihood	Low	Human health	Routing the pipeline along the conveyor and protecting it by safety berms increases the likelihood of the flow reporting to water management facilities rather than more environmentally damaging locations. Therefore EAO considers the likelihood of effects to most VCs following a pipeline leak to be moderate. EAO considers the likelihood of effects to human health to be lower than other VCs (low) because drinking water and country food consumption advisories would be put in place following a leak that would aim to reduce consumption of contaminated food and water.
	Moderate	Surface water quality, soil quality and quantity, wetland ecosystems, aquatic organisms and habitat and western toad	

Factor	Rating	VC	Rationale
Significance Determination	Not significant	Surface water quality, soil quality and quantity, wetland ecosystems, aquatic organisms and habitat, western toad and human health	EAO anticipates that a dewatering pipeline failure would be detected rapidly and arrested. Some locations of rupture would result in flows that could be captured by water management facilities while others would have the potential to impact aquatic ecosystems. However, due to the short-term nature of such an event and its reversibility, EAO does not consider residual effects to be significant.
Confidence	Moderate		Predicting the specific effects of a pipeline leak is challenging due to the numerous uncertainties, such as the extent and location of the leak; however, EAO has moderate confidence in the significance and likelihood determination of the assessment due to the project design and mitigations planned.

Table 27: Summary of Residual Effects for Leaks and Spills During Transport[22]

Factor	Rating	VC	Rationale
Context	Low	Groundwater quality and aquatic organisms	The transport route crosses several fish-bearing watercourses with adfluvial bull trout populations;
	Neutral	Soil quality and	

[22] For the majority of VCs, the ratings for the leak/spill during transport of 1) process reagents, waste, and concentrate and 2) fuel were the same; therefore, they have been combined for the summary purposes of this table. In cases where they differed, the rating with greater implications (e.g., low resiliency high magnitude, long-term) was used.

Factor	Rating	VC	Rationale
		quantity, wetland ecosystems, human health	therefore, the ecological context would be high for fish and surface water quality. Other VCs impacted would not be unique attributes or are already in a partially disturbed state.
	High	Fish, surface water quality	
Resiliency	Low	Ground and surface water quality and wetland ecosystems	Resiliency of aquatic environments would be low in particular for spills of fuel or propane because these liquids would readily incorporate into the environment and be difficult to remediate. Fish communities affected by the spill are expected to recover; therefore fish would have high resiliency.
	Moderate	Soil quality and quantity and aquatic organisms	
	High	Fish and human health	
Magnitude	Low	Groundwater quality, soil quality and quantity	Effects to aquatic environments and organisms would be of high magnitude due the potential for spilled material to result in exceedances of WQG and impacts on biota. Effects on other VCs would be low or moderate.
	Moderate	Human health	
	High	Surface water quality, wetland ecosystems, fish and aquatic habitat and organisms	
Extent	Local	Soil quality and quantity, wetlands and red- or blue-listed ecosystems	The geographic extent of certain effects would be limited to areas proximal to the spill point while the geographic extent of other effects would be landscape-wide, as contaminated water flowed downstream with potential impacts on water quality, aquatic organisms
	Landscape	Water quality, fish and aquatic organisms and habitat and human health	

Factor	Rating	VC	Rationale
			and human health.
Duration	Short (1-5 years)	Soil quality and quantity, wetlands and red- or blue-listed ecosystems, water quality, fish and aquatic organisms and habitat and human health	Spills would be readily detected facilitating rapid response and deployment of recovery equipment enabling a significant portion of any spilled material to be quickly removed from the environment (for solid material) and diluted by the aquatic environment (for liquids). EAO expects these actions would limit the extent of the spill and therefore also the duration of effects on VCs.
Reversibility	Reversible short term	Soil quality and quantity, wetlands and red- or blue-listed ecosystems, water quality, fish and aquatic organisms and habitat and human health	Effects on VCs would be reversible as containment and recovery measures would remove spilled material (concentrate) or they would be quickly diluted, dispersed, volatized or degraded limiting the time in which effects on the environment could occur and making them more readily reversible.
Frequency	Continuous	Soil quality and quantity, wetlands and red- or blue-listed ecosystems, water quality, fish and aquatic organisms and habitat	EAO expects that effects to the environment from a spill would be continuous until the spill was resolved and remediated or assimilated; however effects to human health would depend on human exposure (if people were present in the affected area) and would therefore be sporadic.
	Sporadic	Human health	

Factor	Rating	VC	Rationale
Likelihood	Low	Human Health	EAO considers the likelihood of effects to human health to be low since drinking water and country food consumption advisories would be put in place following a spill that would aim to reduce consumption of contaminated food and water. EAO predicts that effects to aquatic VCs and organisms would be of moderate likelihood following a spill during transport because some areas of the road are not proximal to aquatic ecosystems. Effects to soil and groundwater would be likely since these VCs would be affected by a spill, regardless of location.
	Moderate	Wetlands and red- or blue-listed ecosystems, surface water quality, fish and aquatic organisms and habitat	
	High	Soil quality and quantity, groundwater quality	
Significance Determination	Not significant	Soil quality and quantity, wetlands water quality, fish and aquatic organisms and habitat and human health	EAO considers the residual effects from a leak or spill of waste, concentrate, process reagents, fuel or propane following a crash to be not significant. The effects are anticipated to be of short duration and reversible.
Confidence	Moderate		Predicting the specific effects of a spill during transport is challenging due to the numerous uncertainties, such as the extent and location of the spill and how easily it could be cleaned up; however, EAO has moderate confidence in the significance and likelihood determination

Factor	Rating	VC	Rationale
			of the assessment due to the safety and response procedures planned.

Table 28: Summary of Residual Effects for Fires or Explosions

Factor	Rating	VC	Rationale
Context	Low	Forested ecosystems	Forest ecosystems impacted would not be a unique ecological component.
Resiliency	Moderate		As fires are a natural part of forested ecosystems, they are resilient to this type of disturbance.
Magnitude	Low		Since fires are a natural part of forested ecosystems, the resulting forested ecosystem following a fire would be within baseline conditions.
Extent	Local		Fires would likely be rapidly extinguished so effects would be limited to the vicinity of the incident.
Duration	Far future (more than 50 years)		EAO expects that rapid natural regeneration of the burned site would occur; however, mature trees would take a long time to grow back.
Reversibility	Reversible long term		EAO expects that the full effects of a fire would be reversible over the long term; however, EAO notes that burned areas would likely return to an ecologically-functioning state in the short to medium term.
Frequency	Continuous		Effects of a fire would be continuous until regeneration occurred.
Likelihood	Moderate		EAO considers effects to forested ecosystems to be of moderate likelihood following a fire or explosion of a truck on the transport route. While forested area is in close proximity to roads and readily flammable, depending on the size of the fire, it's

Factor	Rating	VC	Rationale
			likely that it could be extinguished rapidly limiting the extent of the area affected.
Significance Determination	Not significant		Fires would be rapidly extinguished limiting their extent and severity. The forested ecosystem alongside roads is not particularly unique or vulnerable and EAO expects it would regenerate and all effects would be reversible. Further, fires are a natural ecological component and within baseline conditions.
Confidence	High		EAO has high confidence in the assessment due to the nature of the accident and the mitigations and safety measures planned.

Table 29: Summary of Residual Effects for KUG Project TSF Dam Failure

Factor	Rating	VC	Rationale
Context	Neutral	Soil quality and quantity, terrain stability and wildlife	The ecological context of a large number of VCs is considered high because a TSF dam failure would impact a large area and watershed and exposure to tailings would compromise the overall ecological function and capacity of ecosystems to support biota. The context of CULRTP is considered high.
	High	Surface hydrology, surface water quality, forested ecosystems, wetland ecosystems, harvestable plants, fish, aquatic organisms and habitat, western toad, human health, and traditional use of lands	
Resiliency	Low	Terrain stability, wetland ecosystems, harvestable plants, fish, western toad, human health, traditional use of	The resiliency of a number of VCs would be low to the substantial impact of tailings deposition on a large area of the

Factor	Rating	VC	Rationale
		lands	landscape. For example, fish and western toad could have low resiliency if critical spawning and breeding habitat, respectively, was destroyed by the incident. Wetlands, harvestable plants or vulnerable ecosystems could also be destroyed by a TSF dam failure.
	Moderate	Surface hydrology, surface water quality, soil quantity and quality, forested ecosystems, aquatic organisms, wildlife	
Magnitude	Low	Terrain stability	Effects to many VCs would be of moderate to high magnitude due to widespread and long-term impacts on the water and land and resulting impacts to biota, including direct and indirect mortality. Habitat suitability modeling indicates that areas potentially affected by a dam breach include moderate-high quality habitat for grizzly bear, caribou and moose. Impacts to the traditional use of lands and resources would be high. Impacts to human health could be mitigated through drinking water and fish consumption advisories and therefore be moderate.
	Moderate	Human health	
	High	Surface hydrology, surface water quality, soil quantity and quality, forested ecosystems, wetland ecosystems, harvestable plants, fish and aquatic organisms and habitat, wildlife, western toad and traditional use of lands	
Extent	Landscape	Soil quantity and quality, forested ecosystems, wetland ecosystems,	All residual effects would extend beyond the KUG Project footprint to the

Factor	Rating	VC	Rationale
		harvestable plants, wildlife and western toad	broader area as contaminants and sediments flowed downstream. Effects to traditional use of lands could be expected to be beyond regional if the perceived effects resulted in avoidance of lands for traditional uses near Thutade Lake and beyond.
	Regional	Surface hydrology, surface water quality, terrain stability, fish and aquatic organisms and habitat and human health	
	Beyond regional	Traditional use of lands	
Duration	Medium (6-25 years)	Surface hydrology, water quality, periphyton and benthic invertebrates and wildlife	Many of the effects could be expected to persist from the medium to long term (5 to 50 years) with some VCs such as the terrestrial ecosystem and harvestable plants taking longer to recover. EAO expects that some effects could persist to the far future. A dam failure could potentially destroy spawning habitat for fish or breeding habitat for toads, wiping out the local populations. In this case, recolonization of the area could take many years. Contamination of sediment in the aquatic environment could also persist into the far future. These environmental effects could have an impact on traditional use of lands into the far future.
	Long (26-50 years)	Terrain stability, harvestable plants, terrestrial ecosystem and human health	
	Far future (more than 50 years)	Fish and aquatic habitat, western toad, traditional use of lands	
Reversibility	Reversible medium term	Surface hydrology, water quality, periphyton	Although effects would be significant, most VCs are

Factor	Rating	VC	Rationale
		and benthic invertebrates and wildlife, terrain stability, harvestable plants, terrestrial ecosystem and human health	expected to recover over the medium to long-term with natural regeneration and mitigation measures such as replanting to help restore forested landscapes and terrain stability. EAO recognizes, however, that a dam failure could be catastrophic and some VCs may never fully revert to their original state and function.
	Reversible long-term to irreversible	Fish and aquatic habitat, western toad, traditional use of lands	
Frequency	Continuous	Terrain stability, wildlife, surface hydrology, surface water quality, soil quantity and quality, forested ecosystems, wetland ecosystems, harvestable plants, fish and aquatic organisms and habitat, western toad and traditional use of lands	EAO expects that effects to the environment from dam failure would be continuous until remediation or regeneration ultimately occurred; however effects to human health would depend on human exposure (if people were present in the affected area) and would therefore be sporadic.
	Sporadic	Human health	
Likelihood	Moderate	Human Health	EAO considers the likelihood of effects to human health to be moderate since drinking water and country food consumption advisories would be put in place following a dam breach that would aim to reduce consumption of contaminated food and water. However, due to the
	High	Terrain stability, wildlife, surface hydrology, surface water quality, soil quantity and quality, forested ecosystems, wetland ecosystems, red- or blue-listed ecosystems, harvestable plants, fish	

Factor	Rating	VC	Rationale
		and aquatic organisms and habitat, western toad and traditional use of lands	long lasting and widespread nature of effects, certain individuals may not be aware or may not heed advisories for the full duration of effects. EAO predicts that effects to other VCs would be high since a dam breach would be likely to affect a large downstream area.
Significance Determination	Not significant	Terrain stability	Although terrain stability would be impacted, effects would be greatest along Kemess Creek, which is already considered to be unstable. Stability could be improved with remediating efforts. Effects to other VCs are considered significant, however, taking into account the magnitude, geographic extent and long to potentially far future duration. EAO considered effects to wildlife significant based on the high quality habitat for species such as moose that would be affected by a dam breach.
	Significant	Surface hydrology, surface water quality, soil quantity and quality, forested ecosystems, wetland ecosystems, red- or blue-listed ecosystems, harvestable plants, fish and aquatic organisms and habitat, western toad, wildlife human health, and traditional use of lands	
Confidence	Moderate		Predicting the specific effects of dam failure is challenging due to the numerous uncertainties involved, such as the magnitude of failure;

Factor	Rating	VC	Rationale
			however, EAO has moderate confidence in the significance and likelihood determination of the assessment due to the conservative nature of the significance rating and the preventive project design features.

7.1.3.2 *Cumulative Effects*

The assessment of effects from accidents and malfunction is a requirement under section 19(1) of CEAA 2012, which stipulates that the EA must take into account cumulative environmental effects that are likely to result from the designated project in combination with other physical activities that have been carried out. None of the above accidents and malfunction have been assessed as likely to occur; therefore, EAO has not assessed the potential cumulative effects from these events.

7.1.3.3 *Conclusions*

The KUG Project design, mitigation and contingency measures would lower the likelihood and reduce the severity of an accident on the KUG Project. Prior to the commencement of construction activities, AuRico would be required, for the purposes of MA and EMA permit applications to develop an ERP; Environmental Emergency, Spill and Hazardous Materials Plan; Mine Waste, Tailings, and ML/ARD Management Plan; and Air Quality Management Plan, which would address management of hazardous materials, emergency preparedness, prevention and response to an accident or malfunction on the KUG Project.

EAO is satisfied that, the majority of potential accidents and malfunctions, should they occur, would not result in significant adverse effects on the environment. In the unlikely event of a failure of the KUG Project TSF East Dam, significant adverse effects would be expected on the environment and human environment. However, EAO is satisfied AuRico has adequately considered tailings management alternatives to address the risk and consequence of a tailings dam failure through the EA, and that AuRico would be required under the MA and EMA to take sufficient measures to reduce the likelihood of the KUG Project TSF failure, through design and operation requirements, as well as by preparing adequate plans and procedures to reduce the impacts of such an event. EAO

notes that recent updates to the TSF requirements in the Mining Code along with new site characterization guidelines, as described in section 7.1.1 above, would set a high standard of safety for the KUG Project TSF. In addition, EAO has proposed the conditions listed below to address potential accidents and malfunctions. EAO therefore considers the likelihood of a KUG Project TSF failure to be low to negligible.

Based on the combination of proposed KUG Project design, mitigation measures, and having regard to the conditions identified in the TOC and CPD including those listed below, which would become legally binding as a condition of an EAC, and considering the likelihood of occurrence, EAO concludes that the KUG Project is not likely to result in significant adverse effects as a result of accidents and malfunctions.

EAC conditions relevant to accidents and malfunctions include:

- Accidents and Malfunctions Communication Plan;
- Accidents and Malfunctions Administration Plan;
- the establishment of an Environmental Monitoring Committee; and
- a Feasibility Study for the Tailings Beach.

8. Effects of the Environment on the Project

8.1.1 Background

The following environmental effects and processes have the potential to affect the KUG Project and result in effects to VCs:

- climate change;
- avalanches;
- landslides;
- natural seismic and volcanic activity; and
- lightning and forest fires.

AuRico evaluated the likelihood (probability) and consequences (severity) of the effects of the environment on the KUG Project and proposed mitigation measures. AuRico's assessment is described below.

Climate Change

All climate predictions for the KUG Project discussed below are based on data from on-site meteorological stations and regional meteorological stations and the ClimateWNA[23] computer program, which provides 30-year climate data predictions for western North America.

AuRico predicts that climate change may result in a variety of extreme weather events throughout the KUG Project lifecycle, including heavy rain, heavy snowfall, flooding, extreme temperatures, drought and strong winds.

AuRico expects high-magnitude and prolonged rainfall to be relatively infrequent in the KUG Project area. However, if rainfall intensity and duration increases beyond historic norms, the following effects could occur: increased erosion of roads, damage to infrastructure, increased sediment deposition in streams; increased landslide risk (discussed below) and increased groundwater seepage and surface runoff into underground workings, which would increase dewatering requirements. Increased dewatering would result in increases to the volume of water that enters the KUG Project TSF and requires treatment or, in the case of water that has not been in contact with contaminants from mining activities, diverted to a sedimentation pond prior to discharge to the environment.

[23] Wang, T., A. Hamann, D. L. Spittlehouse, and T. Murdock. 2012. ClimateWNA - High-Resolution Spatial Climate Data for Western North America. Journal of Applied Meteorology and Climatology, 51: 16-29.

The KUG Project area currently experiences heavy snowfall during winter and AuRico identifies that severe snowstorms are possible. High levels of snowfall could impede the movement of equipment and vehicles on access roads and at the mine site as well as result in high snowbanks that could impede movement of wildlife. In some cases, animals may become trapped on the road increasing the likelihood of mortality. Heavy snowfall, sleet, or hail could damage infrastructure and roadways and increase avalanche risk (discussed below).

AuRico predicts that low precipitation events are more likely than high precipitation events in the KUG Project area. Periods of drought would reduce the runoff into the KUG Project TSF and underground workings, reducing the needs for dewatering and the volume of water requiring treatment. However, the dilution capacity of the receiving environment would also be reduced, potentially increasing the concentration of contaminants in the discharge. Discharge from the KUG Project TSF could need to be temporarily limited during these periods.

AuRico suggests that extreme cold events are more likely than extreme heat events in the region but both pose a risk for workers' health and machinery. Extended cold spells would also increase power demands for heating. A prolonged winter and period of snow accumulation with increased need for snow management could result secondarily. In contrast, sustained increases in air temperature could result in more precipitation falling as rain than as snow and an earlier melt of the snow-pack. Resulting changes to volume and timing of the spring runoff could impact erosion rates and maintenance requirements for roads, ditches and diversion channels. High temperatures coinciding with drought or high winds would increase wildfire risk, as discussed in below. Increases in temperature swings and freeze-thaw cycles would increase the deterioration rate of roads, building foundations, dams, tunnels and other KUG Project components. However, AuRico would build KUG Project infrastructure to withstand the expected climatic conditions.

High winds could damage KUG Project roofing and equipment covers and blow down trees, which could block roadways and damage power lines.

Avalanches

In the absence of mitigation measures, avalanches pose significant hazards to people and property. Avalanches pose a risk to the KUG Project just above the north entrance to the access corridor tunnel and above the adjacent road section and at high elevations north and southwest of the surface subsidence zone and north of Kemess Lake. Although the KUG Project was designed to reduce avalanche risk, some residual risk remains.

Landslides

AuRico identifies that effects due to landslides are most likely to occur at the decline portal and on access roads. Although engineering design will allow for this effect, landslides still have some potential to damage to infrastructure and vehicles and pose safety hazards to workers. Deterioration in stream water quality could also result from increased mobilization of soil and debris in the watershed.

Natural Seismic and Volcanic Activity

Available information on seismic probability and intensity suggests that the KUG Project is at low risk for a damaging seismic event; however, where infrastructure is not built on firm ground or where unconsolidated material is deposited on slopes, damage to infrastructure and risk to personnel could occur following a seismic event. Areas susceptible to landslides, as described above, could also be at risk for earthquake-induced slope failure.

The KUG Project is located within the Stikine Volcanic Belt, which includes several dormant cones, all at a distance of approximately 250 km from the KUG Project. A volcanic eruption in the region could release gas and ash that would contaminate the local atmosphere, disrupt air traffic and pose a health risk to workers.

Lightning and Forest Fires

Lightning strikes pose a risk to workers, equipment and infrastructure and may also result in fires. Wildfires, ignited by lightning or human-caused, could damage KUG Project infrastructure and impact worker health and safety.

8.1.1.1 *Mitigation Measures*

AuRico incorporated a number of design changes to mitigate the risks of effects of the environment to the KUG Project. These include:

- use of underground panel caving accessed by three declines, with entrances in a portal located in a sheltered saddle to reduce avalanche risk;
- engineering of the decline portal to optimize slope stability;
- selection of the access corridor route to avoid potential avalanche and landslides areas;
- tunnelling through the ridgeline between the mill site and the portal area to reduce landslide, avalanche, and extreme-weather risk to the KUG Project;

- design of diversion ditches to minimize the amount of surface water that comes into contact with contaminants from mining activities and therefore requires treatment;
- removal of explosives magazines from the portal area due to potential landslide/avalanche risk;
- reduction of seismic risks to the KUG Project through the design of a water management strategy to reduce the need for a large tailings dam;
- design and construction of water management structures and KUG Project TSF according to the Canadian Dam Association's Dam Safety Guideline, with the ability to withstand temperature variations and the Maximum Credible Earthquake for the region; and
- design of buildings, roadways and other infrastructure to withstand expected increases in precipitation, wind and snowfall.

Key mitigation measures to respond to effects of the environment, identified by AuRico, include:

- training and protocol to enable a prompt and orderly response to emergencies and minimize loss and damage to workers and the environment;
- monitoring weather forecasts and conditions for storms, extreme temperatures and wildfires to allow time to secure buildings and equipment, close roads (if required) and ensure the safety and preparation of personnel;
- proper maintenance and repair of KUG Project equipment and areas including clearing roadways, roofs, blast areas and active waste and ore stockpiles of excess snow;
- shut-down of non-essential machinery and use of a backup generator during power outages;
- maintaining diversion channels, ditches and culverts and keeping them clear of debris;
- thinning and clearing of vegetation around surface infrastructure to reduce the risk of damage from downed trees and forest fires;
- water management measures to reduce drought-induced water quality deterioration (see Application, Section 23.4.3 for details);
- reviewing seismic hazard assessments for detailed design, and undertaking further assessments as necessary taking into account new available data;
- avalanche management including snow-pack monitoring and controlled blasts; and
- ensuring adequate water supply and equipment for fighting fires.

Further details on design, construction and operations measures to minimize and

mitigate adverse effects of the environment on the KUG Project are contained within the following EMPs:

- Access Management Plan;
- ERP;
- Environmental Emergency, Spill and Hazardous Materials Plan;
- Surface Erosion and Sediment Control Plan;
- Mine Waste, Tailings, and ML/ARD Management Plan;
- Occupational Health and Safety Plan; and
- Surface Water Management Plan.

EMPs also contain monitoring and reporting provisions that would support adaptive management by requiring the collection of data on the efficacy of the plans and informing any modifications required to ensure optimal effectiveness of mitigation measures. For example, the effectiveness of surface erosion and sediment control measures will be monitored during spring freshet and after large rainstorms and will be modified, as needed, to prevent effects such as damaging erosion or slope destabilization. Further information on EMPs including MA permit application requirements with respect to EMPs is contained in section 9 of this report.

8.1.2 Discussion of Issues

No comments were received regarding effects of the environment on the KUG Project.

8.1.2.1 *Analysis and Conclusions*

KUG Project design and mitigation would lower the likelihood and reduce the severity of effects of the environment on the KUG Project. Based on the combination of proposed KUG Project design measures, mitigation measures, implementation of the EMPs and associated plans that are requirements under the MA and the EMA, and having regard to the conditions identified in the TOC and CPD (which would become legally binding as a condition of an EAC), EAO is satisfied that effects of the environment on the proposed KUG Project are not significant.

9. Summary of Environmental Management Plans

EMPs would guide the development and operation of the KUG Project to minimize adverse effects of the proposed KUG Project. The plans provide a framework to communicate and implement monitoring, reporting and mitigation measures and best management practices, and to support compliance with applicable legislation, terms and conditions of permits, and approvals and authorizations issued in relation to the proposed KUG Project, including an EAC, if issued. EMPs would be developed, prior to construction, in consultation with appropriate regulatory agencies, TKN, and key stakeholders, as required.

EMPs were identified by AuRico where potential impacts to VCs were identified in the assessment and to meet the AIR. Sections 9.1 through 9.19 below provide an overview of the plans proposed by AuRico in Chapters 6 and 24 of the Application. Where applicable, plans that are partially addressed by or have been required as EAC conditions are indicated. Many of the plans relate to MA or EMA permitting requirements, as described below, and some plans fulfill other provincial and federal legislative or regulatory requirements, such as the *Fisheries Act*, *Transportation of Dangerous Goods Act* and *Canadian Environmental Protection Act*. EAO also proposed conditions that require the development and implementation of several additional plans to those proposed in the Application. These are listed in sections 9.21 through 9.26 below.

Plans required as part of a MA permit application apply to the mine site (disturbed or cleared area in use for servicing and operating a mine, not including residential facilities) as well as access roads in some cases, while those required for an EMA permit application include downstream effects for air and water. EAC conditions may relate to the mine site or broader areas affected by the KUG Project, as specified within the individual condition.

9.1 Sustainability Management System

AuRico developed the Sustainability Management System (SMS) to provide a framework to ensure a consistent approach to sustainable management for its operations. The SMS provides a performance standard for managing the Health and Safety, Environment Management System and Corporate Social Responsibility components for the KUG Project in a sustainable manner.

9.2 Access Management Plan

AuRico’s proposed plan will help ensure that the existing access point is operated and maintained so that the safety of road users is maximized, access to the mine site is

controlled and adverse effects on the environment and wildlife are minimized. The Access Management Plan is focused on the existing 2-km mine access road into the mine area connecting from the ORAR. While the plan focuses on the access to the mine site, a monitoring component of the plan has been extended to KUG Project-related use of the ORAR (northern portion, where AuRico is the sole industrial user) due to interests and concerns raised by TKN and FLNRO.

The majority of the provisions in this plan would be addressed by other requirements. Access management during construction would be addressed in the Construction EMP, which is a proposed EAC condition. Many of the provisions described in the Access Management Plan would be required under the Traffic Control Plan that is required for a MA permit application. AuRico holds a Road Use permit and a Special Use Permit for its use of the ORAR, issued by FLRNO that address issues such as fees, vehicle size restrictions and maintenance responsibilities. Finally, requirements for forest service roads including maintaining stream crossings are addressed by the Forest Planning and Practices Regulation under the *Forest and Range Practices Act*. The exception is requirements within the Access Management Plan that relate minimizing adverse impacts to wildlife from traffic along the ORAR. To address this gap, EAO has recommended an EAC condition for a Wildlife Management and Monitoring Plan that would address wildlife impacts from the ORAR, where AuRico is the sole industrial user.

9.3 Air Quality Management Plan

AuRico's stated objective of this plan is to establish measures to mitigate emissions from KUG Project activities to meet federal and provincial air quality requirements. The contaminants included for consideration are NO_2, SO_2, CO, suspended PM (total suspended particles, PM_{10}, and $PM_{2.5}$), dustfall, and GHG emissions.

A Waste (Refuse and Emissions) Management Plan, which addresses air contaminants, is a MA permit application requirement.

EAO has also proposed an EAC condition for an Air Quality Management Plan with requirements for mitigation measures and monitoring to ensure that mine emissions do not result in any unacceptable impacts to air quality beyond the active mine area. In addition, the plan would address other requirements relating to human health concerns of off-duty workers at the mine site. Further details on this plan are provided in sections 3.1 and 5. EAO has also proposed a Wildlife Management and Monitoring Plan, as described below, which would include a requirement for dust monitoring along the ORAR.

9.4 Ecosystems Management Plan

The purpose of this plan, as proposed by AuRico, is to provide guidance to minimize potential adverse effects to ecosystem integrity and function within the KUG Project footprint, throughout all phases of the KUG Project. This plan provides management strategies for maintaining ecosystem integrity during the KUG Project's construction and operation activities and for restoration of ecosystem functionality throughout progressive reclamation and closure activities.

EAO has proposed the Ecosystems Management Plan including wetlands management and monitoring, be an EAC condition. Further details on this plan are provided in section 3.6.

Several permitting requirements also relate to aspects of ecosystem management. A MA permit application requires a Vegetation Management Plan, which should include SOP for addressing, if applicable, riparian areas, old growth and mature forests and rare and at risk species and ecosystems. Under the joint MA/EMA permit application requirements, a Re-Vegetation Strategy is also required and should include information on the re-establishment of functional soil condition and natural plant succession. Reclamation plans must include consideration of the adequacy of the reclamation approach to address long-term land use objectives and re-vegetation sustainability.

9.5 Emergency Response Plan

The purpose of this plan, as proposed by AuRico, is to develop a state of readiness which will facilitate a prompt and orderly response to an emergency or spill during the KUG Project. This plan will help AuRico staff identify potential hazards and develop systems to prevent accidents, as well as minimize and mitigate risks, loss and damage to workers and the environment.

Development of an ERP is a requirement of a MA permit application; however not all the components of AuRico's proposed plan are required by the MA. To ensure that Aboriginal groups, community and other users of the area are notified in the event of an emergency that could impact the area, EAO is proposing an Accidents and Malfunctions Communications Plan. In addition, EAO is proposing an Accidents and Malfunctions Administration Plan, which would ensure that AuRico has a plan to address accidents identified as low environmental risk in the Application and manage and monitor accidents along the ORAR including fires.

9.6 Environmental Emergency, Spill, and Hazardous Materials Plan

This plan, as proposed by AuRico, will enable readiness should a spill of hazardous

materials occur, as well as guide the management of hazardous materials onsite. This plan will help AuRico staff identify potential hazards and develop new or upgrade existing systems to prevent spills, as well as mitigate risks, loss and harm to mine site employees, the public, and the environment. Similarly, aquatic ecosystems, air, and vegetation, as well as the fish and wildlife that depend on them, must also be protected from possible deleterious effects of potential spills and hazardous materials.

Although a specific Environmental Emergency, Spill and Hazardous Materials Plan is not a MA or EMA permit application requirement, a Fuel Management and Spill Control Plan and a Chemicals and Materials Storage and Handling Plan are. In addition, EAO considers spills and hazardous materials to be well-regulated by existing provincial and federal legislation (see Application, Section 24.6) and does not foresee regulatory gaps in this area, apart from the above-mentioned issues relating to communication and low-risk accidents, which will be addressed by the Accidents and Malfunctions Communication Plan and the Accidents and Malfunctions Administration Plan. Therefore, EAO is not proposing a stand-alone ERP as an EAC condition.

9.7 Fish and Aquatic Effects Monitoring Plan

The purpose of this plan, as proposed by AuRico, is to outline a structure and scope of the monitoring program for fish and aquatic habitat in watercourses within, immediately adjacent and downstream of the KUG Project. Monitoring will include: effluent monitoring; environmental effects monitoring including fish and benthic invertebrates monitoring studies; and monitoring of accidental discharges.

EMA permits require comprehensive monitoring programs for discharges, immediate receiving environments and a broader Aquatic Effects Monitoring Program. EAO is also proposing an EAC condition for this plan to ensure monitoring and analysis of bioacummulative substances in bull trout in Thutade Lake occurs. These actions are important to TKN provide them with information on contaminant levels in fish and ensure the protection of the Aboriginal title, rights, and interests of the TKN First Nations.

While not an EMP, EAO is also proposing an EAC condition requiring AuRico to engage with TKN through an Environmental Monitoring Committee to demonstrate how the design of the effluent diffuser has maximized effectiveness using creek flow characteristics to minimize distance of the IDZ, and to monitor the IDZ and ensure fish habitat use is mitigated.

9.8 Groundwater Monitoring Plan

This plan, as identified by AuRico, will provide the initial framework for monitoring

groundwater quality and quantity affected by underground workings. The objective of this plan is to identify any KUG Project related effects on groundwater and to support potential adaptive management for the KUG Project.

A Mine Site Water Management Plan, which addresses groundwater, is a requirement of a MA permit application. EAO is also proposing an Amazay Lake Monitoring Plan to, among other objectives, detect groundwater movement from the underground cave and subsidence zone to Amazay Lake. This plan is important to validate the predictions of the EA and address potential effects on Aboriginal Interests. This plan is described further below.

9.9 Heritage Management Plan

The purpose of this plan, as identified by AuRico, is to protect heritage resources associated with the KUG Project and establish control measures to mitigate potential effects on known archaeological sites within or adjacent to the KUG Project footprint during the construction phase. The Heritage Management Plan also must consider the potential of unknown archaeological sites which may be discovered during construction, operations and closure phases of the KUG Project. It outlines a procedure to discover these sites and how to mitigate potential effects on any newly discovered sites within or adjacent to the KUG Project footprint.

A MA permit application requires an Archaeological Management and Impact Mitigation Plan, which would include the same provisions as the Heritage Management Plan; therefore, EAO is not proposing this plan as an EAC condition.

9.10 Invasive Plant Management Plan

AuRico proposed this plan to provide guidance on strategies to avoid, minimize, and mitigate the introduction and spread of invasive plants resulting from the KUG Project's activities. Invasive plant prevention and control strategies will be implemented throughout the KUG Project.

EAO has proposed an EMP (described below) as an EAC condition, which would require details on how invasive plant management would be addressed.

A MA permit application requires either a Vegetation Management Plan, which should include SOP for addressing invasive plant species or an Invasive Plant Management Plan to highlight key considerations for early identification and effective management of invasive plants in order to facilitate successful site reclamation. Therefore, EAO is not proposing a stand-alone Invasive Plant Management Plan as an EAC condition.

9.11 Mine Waste, Tailings, and ML/ARD Management Plan

The purpose of this plan, as identified by AuRico, is to layout best management practices and approaches to avoid and minimize oxidation of sulphide minerals to reduce the long-term risks to the receiving environment. It describes the operating procedures for managing waste rock and tailings from the extraction and processing of ore, and preventive measures for potential ML/ARD.

This plan is a requirement of a MA permit application. In consideration of the nature of the issues in this EA and the subsequent permitting process, EAO is not proposing this plan as an EAC condition.

9.12 Occupational Health and Safety Plan

As identified by AuRico, this plan will assist in providing and maintaining a safe and healthy work environment for all persons engaged in AuRico's work sites. This plan addresses the roles and responsibilities of key personnel, and the workplace conditions for maintaining a safe and healthy work environment.

This plan is a requirement of a MA permit application. In consideration of the nature of the issues in this EA and the subsequent permitting process, therefore, EAO is not proposing this plan as an EAC condition.

9.13 Soil Handling Management Plan

As proposed by AuRico, the purpose of this plan is to minimize the spatial extent of the disturbance footprint of the KUG Project, while maximizing the salvage of soil resources within the footprint. The plan provides guidance on the best practices to remove and salvage soil where practical and describes methods of conserving the stored soil's biological qualities.

A MA permit application requires a Reclamation Plan including a Soil Management Strategy as well as a separate standard operation procedure that will direct implementation of best management practices during soil salvage and stockpiling operations; therefore, EAO is not proposing this plan as an EAC condition.

9.14 Subsidence Effects and Terrain Monitoring Plan

The purpose of the plan, as proposed by AuRico, is to outline the regulatory requirements and guidelines applicable to monitoring the effects of subsidence on the surface and terrain instability resulting from the KUG Project. With adequate mine design and geotechnical monitoring, the KUG Project's projected subsidence zone can

be projected and monitored and environmental effects resulting from the projected subsidence can be mitigated.

A MA permit application requires conceptual plans for landform design; therefore, EAO is not proposing this plan as an EAC condition.

9.15 Surface Erosion and Sediment Control Plan

The overall purpose of this plan, as identified by AuRico, is to minimize the potential for mobilizing sediment, destabilizing slopes, and compromising surface water quality and aquatic habitat resulting from mining activities throughout the life of the KUG Project. The plan outlines key roles, as well as provides guidance on assessing erosion potential and developing prescriptions for event-based control strategies.

This plan is a requirement of a MA and EMA permit application. In addition, EAO is proposing a Construction EMP as an EAC condition, which would require details on how surface erosion and sediment control would be addressed. In consideration of the nature of the issues in this EA and the subsequent permitting process, EAO is not proposing a stand-alone Surface Erosion and Sediment Control Plan as an EAC condition.

9.16 Surface Water Management Plan

As identified by AuRico, the purpose of this plan is to provide guidance for the operation and maintenance of water management infrastructure during all phases of the KUG Project. Water management features include: potable water supply, water diversion ditches, collection and sedimentation ponds, dewatering and treatment facilities.

A Mine Site Water Management Plan, which addresses surface water management, is a requirement of a MA permit application; therefore, EAO is not proposing this plan as an EAC condition.

9.17 Waste Management Plan

The primary purpose of this plan, as identified by AuRico, is to protect workers, the public, and the environment from potentially adverse effects associated with the management of waste from the KUG Project. The plan describes measures to achieve compliance with regulatory requirements and will be integrated with the existing (KS) Waste Management Plan.

A Waste (Refuse and Emissions) Management Plan is a MA and EMA permit application requirement; therefore, EAO is not proposing this plan as an EAC condition.

9.18 Water Treatment Plan

The purpose of this plan, as proposed by AuRico, is to describe the rationale, framework, and scope of the proposed water treatments to be implemented during the construction, operations and closure phases of the KUG Project. The plan will have a corresponding monitoring program to ensure regulatory compliance, implement and monitor the effectiveness of mitigation measures and verify the predictions of the EA. The plan will focus on the KUG Project TSF, the proposed water treatment plants and the discharge pathway along Attichika Creek.

A Mine Site Water Management Plan, which addresses water treatment, is a requirement of a MA permit application.

Although it is not a plan, it is important to note here that EAO is proposing an EAC condition requiring water treatment as the assessment presented in the Application is based on treatment. This condition is important to guarantee that treatment will form a part of the KUG Project in permitting. EAO is also proposing a condition to manage Se concentrations in Waste Rock Creek during post-closure.

9.19 Wildlife Management and Monitoring Plan

The purpose of this plan, as proposed by AuRico, is to outline the regulatory requirements and guidelines applicable to managing wildlife and to provide guidance on minimizing adverse effects to wildlife resulting from the KUG Project's activities. The plan identifies established conservation guidelines and environmental protection measures recommended for ensuring that target species are not adversely affected as a result of the KUG Project's activities.

Although a Wildlife Management Plan is a MA permit application requirement, many wildlife mitigation measures required for the KUG Project would be not be addressed by the MA requirements including those measures that extend off the mine site. Therefore, EAO is proposing the Wildlife Management and Monitoring Plan including components specific to terrestrial migratory birds and bats, alpine species, caribou and the ORAR as an EAC condition to ensure key wildlife mitigation measures are implemented for the KUG Project. Further details on potential effects to wildlife and mitigation measures proposed for the plan are contained in section 3.5 of this report.

9.20 Reclamation and Closure Plan

This plan, as proposed by AuRico, presents the conceptual reclamation and closure activities and monitoring plans required for new infrastructure associated with the KUG Project, which excludes KS infrastructure excepting the KS open pit (to be used as the

KUG TSF). The objective of reclamation and closure activities would be to transition the site from mining to conditions that approximate pre-project land use in a manner that meets regulatory requirements. The plan includes soil management and re-vegetation plans and reclamation and closure plans for specific KUG Project infrastructure areas. Further details on this plan are available in Chapter 6 of the Application.

This plan is a requirement of a MA permit application. In consideration of the nature of the issues in this EA and the subsequent permitting process, EAO is not proposing this plan as an EAC condition.

9.21 Construction Environmental Management Plan

EAO is proposing the Construction EMP as an EAC condition to address typical issues relating to the construction of a major project such as erosion and sediment control, waste management, access management and human-wildlife contact.

This plan is also a requirement of a MA permit application; however EAO is of the view the issues addressed in this plan are of sufficient importance to justify its inclusion in the EAC.

9.22 Accidents and Malfunctions Communication Plan

EAO is proposing this plan as an EAC condition to address how Aboriginal groups, communities and other users of the area affected by an accident or malfunction would be notified in the event of an accident (e.g., tailings breach).

9.23 Accidents and Malfunctions Administration Plan

EAO is proposing this plan as an EAC condition to ensure that AuRico has a plan to address accidents identified as low environmental risk in the Application and manage and monitor accidents along the ORAR including fires.

9.24 Amazay Lake Monitoring Plan

EAO is proposing this plan, which would include requirements for a surface water quality monitoring plan for Amazay Lake and a groundwater monitoring plan to detect potential groundwater movement from the underground workings towards Amazay Lake to be developed by a QP to ensure no adverse effects to the culturally important Amazay Lake and address potential effects on Aboriginal Interests.

9.25 Health and Medical Services Plan

This plan would describe the means for the provision of health services to KUG Project

employees, in keeping with Northern Health's *Health and Medical Services Plan Best Management Guide for Industrial Camps*.

EAO has proposed the Health Services Management Plan as an EAC condition to facilitate the provision and coordination of medical services to KUG Project employees.

9.26 Socio-Community and Economic Management Plan

This plan would describe AuRico's plans for communicating and engaging with the community; the process for issues management, include a grievance procedure; and the means by which the HWMP and the EFAP will be implemented.

EAO has proposed the Socio-Community and Economic Management Plan as an EAC condition to formalize AuRico's commitment to engaging with local communities to address socio-economic effects associated with the KUG Project, should they arise.

10. CEAA 2012 Requirements

Subsection 19(1) of CEAA 2012 identifies the factors which must be taken into account in an EA under CEAA 2012. These factors have been addressed by EAO in the appropriate sections of this report. In addition to the factors that are considered as part of the assessment of individual VCs (e.g., Adfluvial bull trout, grizzly bears), the following factors are considered in separate sections of this report: alternative means of undertaking the project (Part A, section 1.2.4); the purpose of the project (Part A, section 1.2.3); and accidents and malfunctions (Part B, section 7) and effects of the environment on the project (Part B, section 8).

In conducting a substituted EA, under the provisions of CEAA 2012, EAO is required to consider the environmental effects identified in subsections 5(1) and 5(2) of CEAA 2012. This section discusses the assessment for each of the subsections and references other relevant parts of this report where additional details are presented.

10.1 Environmental Effects Related To CEAA 2012 5(1)(a)

Paragraph 5(1)(a) requires an assessment of changes the project may cause to the following federal areas of responsibility:

(i) fish and fish habitat as defined in subsection 2(1) of the *Fisheries Act*;
(ii) aquatic species as defined in subsection 2(1) of SARA; and
(iii) migratory birds as defined in subsection 2(1) of the *Migratory Birds Convention Act, 1994*.

The assessments of these effects are included within the assessments of various VCs assessed earlier in this report. Table 30 highlights the linkages to the relevant sections of this report and highlights the key mitigation measures.

Table 30: Summary of Effects Related to CEAA 2012 5(1)(a)

Key Mitigation Identified by EAO	Effects Assessment (Predicted Residual Effects)	EAO's Significance Conclusion**
Fish and fish habitat as defined in subsection 2(1) of the *Fisheries Act*		
Key mitigation measures related to reducing effects on fish and fish habitat from the Application include: Use of monitoring and adaptive	The assessment in the Fish and Aquatic Habitat section of this report directly assess fish and fish habitat (section 3.4), as defined in subsection	**Water Quantity: Waste Rock Creek** Context – L (fish); H (habitat) Magnitude – H

Key Mitigation Identified by EAO	Effects Assessment (Predicted Residual Effects)	EAO's Significance Conclusion**
management to address effects of the KUG Project including through: • Ensure that there are no incremental effects from the KUG Project on Se in Waste Rock Creek from the KUG Project TSF; • Fish and Aquatic Effects Monitoring Plan requiring monitoring of concentrations of bioaccumulative contaminants in bull trout in Thutade Lake; • Comparison of fish and aquatic effects monitoring plan results to water quality monitoring results; • Requirement for AuRico to engage with TKN on the design of the diffuser to show how it minimized the length of the IDZ, and implement mitigation measures for any observed adverse effects of the IDZ on fish habitat use; • Prevention of direct mortality to fish from increased human presence through the "no fishing" policy for all KUG Project staff and contractors; • Prevention of effects on fish habitat: o Conduct instream works during the appropriate fisheries work window with a QP present; • Water flow management to reduce effects of changes in water quantity, and reduce run-off, sedimentation and effects on water quality:	2(1) of the *Fisheries Act*. The Application assesses effects to fish and aquatic habitat using fish species, water quality, and water quantity as intermediary components. The LSA include several creeks and rivers included in the assessment. Predicted residual effects of the KUG Project on fish and aquatic habitat are: • Streamflow increases in Attichika Creek during construction may have a minor, short-term effect on bull trout; however, these effects are expected to be limited because the discharge location would be downstream of core bull trout habitat and the discharge is staged on a monthly basis to a volume proportional to Attichika Creek monthly streamflow. • Streamflow increases in Waste Rock Creek during closure, and post-closure are expected to be beneficial to fish by resulting in increased access to spawning	Extent – Local Duration – Perm Reversibility – I Frequency – C **Water Quantity: Attichika Creek** Context – H Magnitude – Low Extent – Local Duration – ST Reversibility – Rev Frequency – R **Water Quality: Waste Rock Creek** Context – Low Magnitude – H Extent – Local Duration – FF Reversibility – I Frequency – R-C **Water Quality: Attichika Creek** Context – H Magnitude – M-H Extent – Local Duration – ST Reversibility – R Frequency – S **Likelihood – H** **Significance –**

Key Mitigation Identified by EAO	Effects Assessment (Predicted Residual Effects)	EAO's Significance Conclusion**
o Wetting work areas and roads to prevent surface erosion; o Controlling and directing runoff from disturbed areas by grading slopes and ditching to reduce sedimentation and changes to water quality; o Stabilizing water diversion channels and ditches and protecting channel banks; o Use of sediment management structures such as silt fences, straw bales, check dams, fabric-covered triangular dikes, gravel or sand-filled burlap bags, and sedimentation ponds and rip-rap along channels and ditches; o Staging discharge from the KUG Project TSF to a volume proportional to the Attichika Creek monthly streamflow and restricted to the open water months; o Use of non-contact diversion ditches and sediment ponds to isolate non-contact water from contact water; Waste management to reduce effects on water quality: • Effluent water quality from the KUG Project TSF will be managed by two stages of water treatment comprised of Se ion exchange (Se-IX) treatment and MR treatment. AuRico will be required to	habitat for Dolly Varden. • Changes to water quality in Waste Rock Creek, while high magnitude, are predicted to be localized in extent, within the range of pre-KS and not likely to result in negative effects to Dolly Varden. • Changes to water quality in Attichika Creek in the IDZ of the discharge pipe resulting in occasional exceedances of the chronic (30-day) exposure levels for the WQG. Changes to water quality are expected to be short-term, reversible and limited in extent; they are not predicted to reach the nearest downstream bull trout spawning habitat. EAO is satisfied that the KUG Project would not have significant adverse residual water quality effects on fish and aquatic habitat in Attichika Creek.	**Not significant**

Key Mitigation Identified by EAO	Effects Assessment (Predicted Residual Effects)	EAO's Significance Conclusion**
treat the effluent from the KUG Project TSF for metals and Se to meet WQG or SBEB; • PAG waste rock from the underground will be managed by subaqueous deposition in the KUG Project TSF; • Waste rock from the excavation of the access tunnel will be managed according to ML/ARD potential; o Blasting residues will be limited to the East Pit quarry and the underground mine and waste rock generated from mining will be deposited into the KUG Project TSF to reduce nutrient loading to streams; • Vegetation to reduce soil exposure and surface erosion: o Revegetating disturbed areas; o Retention of roots and groundcover where possible to maintain slope stability and prevent surface erosion; o Phased removal of vegetation to limit exposure of soils; and o Progressive reclamation and re-vegetation of decommissioned areas. • Monitoring and adaptive management to address water quality effects of the KUG Project: o Water quality monitoring in		

Key Mitigation Identified by EAO	Effects Assessment (Predicted Residual Effects)	EAO's Significance Conclusion**
Amazay Lake; o Adaptive management to address effects of the KUG Project if those effects: o are not mitigated to the extent contemplated in the Application; or o are not predicted in the Application.		
Aquatic species as defined in subsection 2(1) of SARA		
N/A	Aquatic species include fish and marine plants. The assessment of effects to fish is summarized in the row above. There are no marine plants in the KUG Project area or which have the potential to be affected by it (the location is far inland).	N/A
Migratory Birds as defined in *Migratory Birds Convention Act, 1994*		
• The key mitigation measures related to reducing impacts to habitat loss and alteration for migratory birds would be contained in the Wildlife Management and Monitoring Plan, which would include the following: • Pre-clearing surveys of migratory birds by QP; • A scientifically sound approach for monitoring that includes: o A list of existing standards to be followed during the	Migratory water and landbirds are assessed as part of the wildlife section of this report (section 3.5). The LSA supports at least 44 species of migratory waterbirds and 58 species of migratory landbirds. The Application assesses impacts to these two groups from habitat loss and alteration, sensory disturbance, direct	Context – M Magnitude – L-M Extent – D (habitat loss); Lo (sensory disturbance) Duration – MT (sensory disturbance); FF (habitat loss) Reversibility – R Frequency – OT (habitat loss); C (sensory

Key Mitigation Identified by EAO	Effects Assessment (Predicted Residual Effects)	EAO's Significance Conclusion**
KUG Project, including RISC standards for inventory and survey methods of Forest and Grassland Birds (including recommendations for survey frequency and timing), as well as other species-specific survey and inventory methods accepted by ECCC where applicable for species that are often not detected using RISC standards; o Descriptions of how surveys will be carried out by a QP in a manner that protects and avoids harming, killing or disturbing migratory birds or destroying or taking their nests or eggs, following advice from ECCC's Avoidance Guidelines (http://www.ec.gc.ca/paom-itmb/); • Protection of active nest sites by species specific buffers using guidance from General Nesting Periods of Migratory Birds in Canada, ECCC 2016, with a minimum 30 m buffer if evidence of nesting is observed and avoiding clearing outside of the reduced risk window as identified in the Region 7 Omineca – Reduced Risk	mortality, chemical hazards (waterbirds only) and attractants (landbirds only). For migratory landbirds, the Application evaluates habitat loss and sensory disturbance impacts to Olive-sided flycatcher (OSF) separately from the overall group, due to its status as threatened under SARA and particular habitat requirements. Predicted effects of the KUG Project on (percentages in brackets are potential impacts to % of habitat in LSA and in RSA): Migratory landbirds • Habitat loss and alteration (LSA:2.9%; RSA:0.026% RSA) • OSF: Habitat loss and alteration (LSA: 7.6%; RSA: 0.087%) • OSF: Sensory disturbance due to general project noise, blasting, and instantaneous traffic noise (up to LSA: 7.8%; RSA: 0.089%) Migratory waterbirds -	disturbance) Likelihood – M Significance – Not significant

Key Mitigation Identified by EAO	Effects Assessment (Predicted Residual Effects)	EAO's Significance Conclusion**
Windows for Fish and Wildlife (Ministry of Water, Land and Air Protection 2004) is not possible; • Bi-weekly nest surveys of infrastructure potentially used by barn swallows for nesting, during the breeding season. A species-specific buffer must be employed around all probable or actual nest sites that are detected during pre-clearing point count surveys or on infrastructure. These nests must be monitored until the young have fledged or the nest is abandoned. The minimum buffer distance of 30 m must be utilized wherever practicable as determined by a QP • Requirement to record the exact buffer distance employed for any nest sites and report the outcome of the nesting attempt in annual reporting; • Water quality monitoring in the KUG Project TSF and collection ponds will be conducted as part of the Surface Water Management Plan. If these waters contain chemicals above WQG, appropriate mitigation will be applied to deter wildlife from these ponds (e.g. possibly noise deterrents); • monitor / record on-site wildlife observations, sightings,	Habitat loss and alteration: • Wetland birds (LSA: 1.9%; RSA: 0.022%) • Cavity-nesting waterfowl (LSA: 3.3%; RSA: 0.034%) • Riverine birds (LSA: 1.1%)[24]	

[24] Riverine birds: Lost or altered habitat is calculated using length of stream (km) instead of area. Not calculated for RSA.

Key Mitigation Identified by EAO	Effects Assessment (Predicted Residual Effects)	EAO's Significance Conclusion**
incidences and interaction with KUG Project infrastructure; • noise dampening on equipment (mitigation for sensory disturbance); • adaptive management to address effects of the KUG Project if those effects: o are not mitigated to the extent contemplated in the Application; or o are not predicted in the Application.		

Note: Residual Effects Ratings: Context (N – Neutral, L – Low resilience, low capacity to recover , M – Moderate resilience, moderate capacity to recover, H – High resilience, high capacity to recover); Magnitude (N – Negligible, L – Low, M – Moderate, H – High); Geographic Extent (D – Discrete (Project Site), Lo – Local, Re – Regional; BR – Beyond Regional); Duration (ST – Short-term, MT – Medium-term, LT – Long-term, FF – Far Future); Frequency (OT – One time, S – Sporadic, R – Regular, C – Continuous); Reversibility (R – Reversible, PR – Partially Reversible, I – Irreversible); Likelihood (L – Low likelihood, M – Moderate likelihood, H – High likelihood) . Please see Appendix 1. Characterization of Residual Effects, of this assessment report for details on the rating criteria.

10.2 Environmental Effects Related To CEAA 2012 5(1)(B)

CEAA 2012 5(1)(b) requires an assessment of a change that may be caused to the environment by the project that may arise:

(i) on federal lands,
(ii) in a province other than the one in which the act or thing is done or where the physical activity, the designated project or the project is being carried out, or
(iii) outside Canada.

10.2.1 Federal Lands

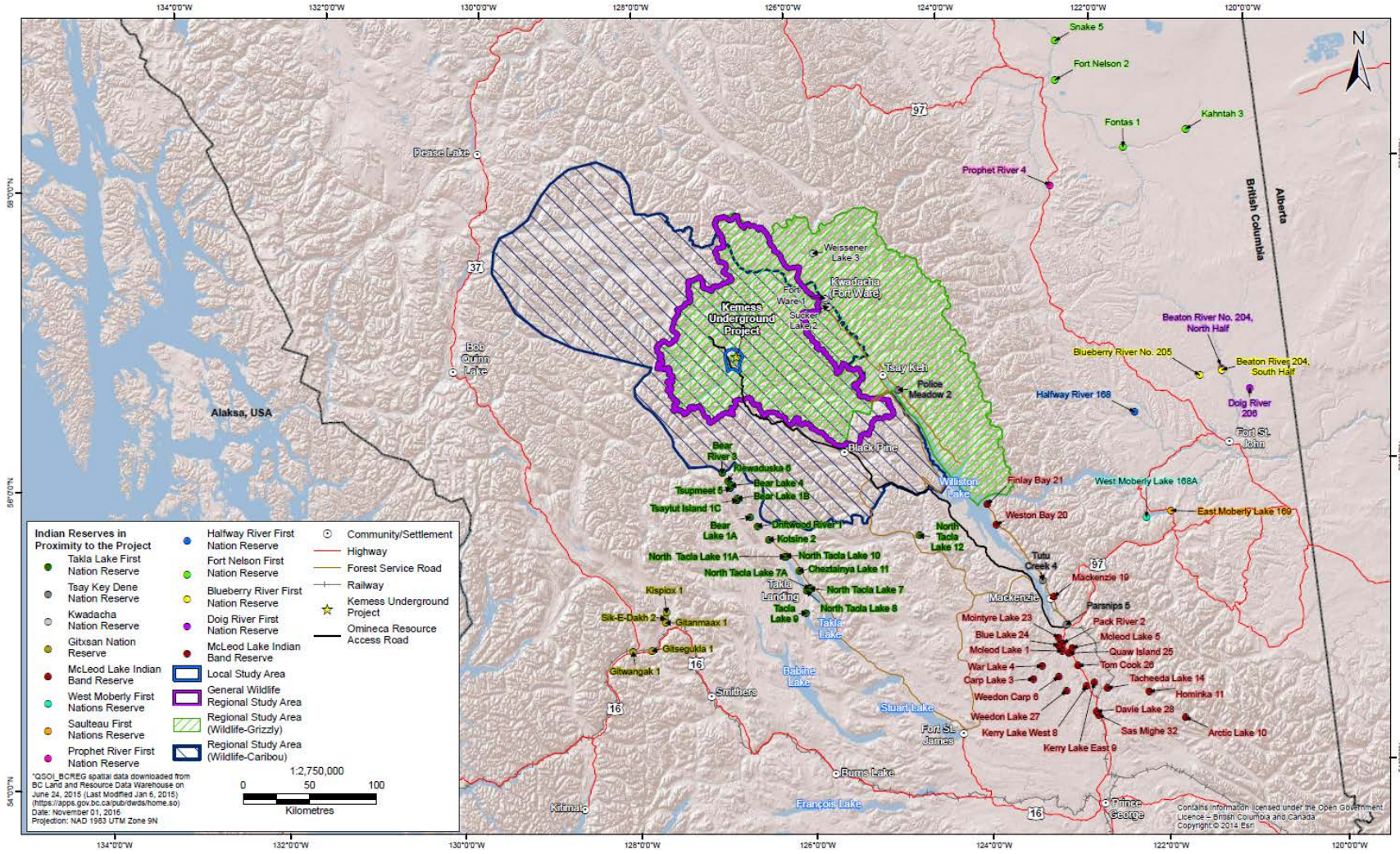
Federal lands that fall within the assessment boundaries for VCs of the KUG Project are the following (approximate distance from the KUG Project as the crow flies in brackets). All of the below federal lands are Indian Reserves (IR):

- Fort Ware – KwN (76km)
- Suker Lake 2 – KwN (78km)

- Weissener Lake 3 – KwN (96km)
- Police Meadow 2 – TKD (123km)

All of these IRs fall within the grizzly bear RSA. There are no federal lands in any other assessment boundary for the KUG Project (and therefore no predicted effects on other VCs on federal lands; see Figure **12** below; i.e. there are no federal lands that fall within the general wildlife or caribou RSAs). The effects assessment of grizzly bear did identify residual effects (Section 15.6.5 of the Application), however, the residual effects are characterized to be local in scale and thus not expected to impact grizzly bears that may be located in or proximal to any IR (located ~100 km from the KUG Project).

Figure 12: Location of Federal Lands



10.2.2 Other Provinces

The KUG Project site is approximately 415 km from the Alberta border and approximately 330 km from the Yukon border (see Figure **12** above). Neither the Province of Alberta nor the Yukon Territory is within any of the regional assessment areas. Accordingly, there are no predicted changes to the environment from the KUG Project that might occur in another Province or territory (except for GHG, which are discussed below).

10.2.3 Outside Canada

The only predicted effects from the KUG Project outside of Canada would be related to GHG emissions. As discussed in section 3.2 of this Report, EAO concludes that there would not be significant residual adverse effects of the KUG Project related to GHG emissions in the context of CEAA 2012 5(1)(b). The summary of effects from GHG emissions is provided in Table 31.

Table 31. Summary of Effects from GHG Emissions in the Context of CEAA 2012 5(1)(b).

Key Mitigation Identified by EAO	Effects Assessment (Predicted Residual Effect)	EAO's Significance Conclusion (see Table 30 for residual effects ratings)
• Implementation of energy efficiency measures including fuel efficiency; • Procurement policies to identify fuel and equipment specifications; • Regular servicing of all mobile and stationary equipment; • Training and instruction for on-site staff with duties related to the operation of equipment that emits air pollutants or controls air emissions; • Reducing equipment	EAO concludes that the KUG Project will have residual adverse effects on climate change from increases to GHG emissions during construction and operations from land clearing resulting in the release of stored carbon, stationary fuel combustion, fugitive emissions related to refueling of equipment and on-site transportation. AuRico predicts that during the construction phase, total GHG emissions are estimated to be 56,530	Context – L-M Magnitude – N-L Extent – BR Duration – FF Frequency – C Likelihood – H Significance – Not significant

Key Mitigation Identified by EAO	Effects Assessment (Predicted Residual Effect)	EAO's Significance Conclusion (see Table 30 for residual effects ratings)
exhaust by: retrofitting older engines, using low-sulphur diesel, reducing idle times, using electric powered equipment whenever practical, and operating vehicles at designated speeds on site roads; • Reducing stack emissions by monitoring generator, heater and fan fuel consumption and operating parameters to ensure efficient operation; • Limiting new land clearing disturbance and recovery of merchantable timber; • Partially restoring the natural carbon sink on site by reclaiming much of the disturbed areas; • A provincial carbon tax, introduced in 2008 through the Carbon Tax Act; and • A carbon-neutrality mandate for all public sector operations (Carbon Neutral Government Regulation), largely achieved through the sourcing of province-based offsets.	tonnes CO2e annually. This would be about 0.09% of the most recent BC estimate (2014) of 64,000,000 tonnes CO2e; 0.008% to the national (2014) total and 0.00013% to the global (2012) total. During the operations phase, total GHG emissions are estimated to be 37,802 tonnes CO2e annually. This equates to about 0.06% of the most recent BC estimate, 0.005% of the federal estimate, and about 0.00008% of the total global emissions.	

10.3 Effects of Change to the Environment on Aboriginal Peoples Related to CEAA 2012 5(1)(c)

CEAA 2012 5(1)(c) requires the assessment of any change to the environment caused by the Project on Aboriginal peoples:

(i) health and socio-economic conditions;

(ii) physical and cultural heritage;
(iii) the CULRTP; or
(iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

Aboriginal people seasonally occupy and use the area impacted by the KUG Project. The effects on Aboriginal peoples are also considered and assessed in other sections of this report, including the assessments of social, economic, heritage and health VCs, as well as the assessment of impacts to Aboriginal Interests, in Part C.

All components and activities within the scope of the EA for the KUG Project (as defined by the May 14, 2014 Section 11 Order and the December 21, 2016 Section 13 Order for the KUG Project) are within the traditional territories of TLFN and TKD, and immediately upstream of KwN's traditional territory (see Figures 21.3-1, 21.3-2 and 21.3-3 of the Application). TLFN, TKD and KwN have a common Sekani heritage and formed an alliance prior to the start of the KUG environmental assessment called the TKN. TKN work together when engaging with government and industry on projects or matters of shared interest. Each First Nation within TKN is represented by their respective Chiefs and decisions of TKN are made by consensus. The alliance formed by the TKN First Nations is based on their common history, culture and language, and deep social and political ties.

The KUG Project (i.e. the area of existing and proposed project infrastructure) is adjacent to the traditional territory of Gitxsan wilp Nii Kyap. It is also within the Treaty 8 Disputed Area, which is the area of disagreement between the Federal and Provincial governments concerning the western boundary of Treaty 8 (the KUG Project is within the Federal boundary but not the Provincial one; see Figure 21.1-1 of the Application). The following BC-based First Nations are signatories to Treaty 8:

- WMFN
- Saulteau First Nation (SFN)
- McLeod Lake Indian Band (MLIB)
- Blueberry River First Nations (BRFN)
- Doig River First Nation (DRFN)
- Fort Nelson First Nation (FNFN)
- HRFN
- Prophet River First Nation (PRFN)

The Application states that WMFN has identified the KUG Project as within the "Preferred Treaty Territory" of WMFN based information in the document WMFN

2012;[25] however WMFN did not provide comments to EAO or AuRico about the potential impacts of the KUG Project on their use of their traditional territory. As all signatories to Treaty 8 have rights throughout Treaty 8 territory regardless of their preferred areas of practice, EAO notified all BC-based Treaty 8 Nations of key milestones in the EA and offered each of them $12,300 of capacity funding provided by the Agency to participate in the EA. DRFN and HRFN accepted the offer of capacity funding and confirmed their interest in participating in the Application review stage of the EA. The capacity funding was provided in May 2016 to HRFN and June 2016 to DRFN. FNFN declined to participate in the EA stating they support the position of the Treaty 8 First Nations most affected by the KUG Project. EAO did not receive a response from WMFN, SFN, MLIB, BRFN, or PRFN despite several efforts at communication. HRFN was the only Treaty 8 Nation to provide comments during Application review.

The KUG Project would overlap with areas used primarily by TKN members. TKN provided EAO with traditional use information during the EA. The Application also includes a TKN traditional knowledge and land use study (see Appendix 20-A of the Application); information from which is used in this section of this report and in Part C. AuRico funded an archaeological overview assessment for the KUG Project area, the results of which were incorporated into relevant chapters of the Application (sections 19, 20 and 21) and this section and Part C of this report.

MNBC has indicated that they use land across all of BC for traditional uses. MNBC provided AuRico with their Traditional Land Use and Occupancy Report (the Use and Occupancy Study; UOS), which includes information on historic, current and potential future resource harvesting and cultural activities in a “buffer zone”, which is within 200 km of the KUG Project. EAO received a comment from MNBC during the public comment period on the draft Assessment Report and draft conditions of an EAC and draft federal conditions of a Decision Statement. These issues are described in section 12.3.3 and summarized below in sections 10.3.1 and 10.3.3.

The KUG Project would be located on provincial crown land, over which TKD and TLFN assert Aboriginal title. It would be located next to the past-producing KS. Much of the infrastructure from KS would be employed for the KUG Project, such as, administrative and accommodation facilities, the process plant, onsite access roads and the existing airstrip. Also, the former KS pit would be used as the KUG Project TSF. General access to the KUG Project area has already been restricted since KS began construction in 1996. The KUG Project area is accessible by road via the ORAR (distance to

[25] WMFN. 2012. *"We Used to Come Here All the Time": A Review of the Proposed Dawson Creek to Chetwynd Transmission Line in Western Treaty No. 8*. Prepared for BC Hydro and Power Authority by WMFN: Moberly Lake, BC. – As referenced in the references section of chapter 20 of the Application

Mackenzie along the road is approximately 400 km). Access to the proposed mine site is currently restricted by a manned gate near the junction of the ORAR and the Kemess Mine Access Road.

The LSA is the area around the KUG Project footprint where there would be a reasonable probability of immediate effects on a VC. The potential effects of the KUG Project would be limited to the RSA, which would be the largest geographical extent of KUG Project effects (see Figure 20.3-1 for the LSA and RSA). The LSA and RSA boundaries are the same as those used for the wildlife and terrestrial ecology assessments in order to capture potential effects related to resource harvesting (including hunting, trapping, fishing and gathering). The LSA overlaps the traditional territories of TLFN and TKD and is and immediately adjacent to and upstream of KwN's traditional territory. The RSA overlaps with the traditional territories of all TKN member Nations.

In addition to the TKN and MNBC specific information noted above, the Application reviewed publicly available information on Gitxsan wilp Nii Kyap and the BC-based Aboriginal groups who are signatories to Treaty 8. The review of information, including an opportunity for the groups to review the draft material relevant to them, resulted in the following Treaty 8 First Nations being screened out from AuRico's assessment of "Effects of Change to Environment on Aboriginal Peoples Related to CEAA 2012 5(1)(c)": FNFN, DRFN, BRFN, HRFN, MLIB, PRFN and SFN. There is no information suggesting that these groups use the RSA for any activities (except as provided by HFRN, see below). AuRico's assessment concerning these Treaty 8 First Nations being screened out was shared with the affected First Nations in September 2015 and they were asked to provide comments, however no additional information was provided besides comments from HRFN described below.

On June 24, 2016, HRFN submitted comments to EAO on the Application. HRFN stated that there are known TUS sites, some as close as 60 km to the KUG Project and HRFN has information that suggests HRFN members traditionally occupied the area surrounding the KUG Project.

HRFN raised concern that the KUG Project would contribute to increased habitat fragmentation and loss of wildlife habitat (resulting in increased stress on wildlife populations, in particular, in already declining moose and caribou populations that HRFN rely on for food and clothing accessories). HRFN disagreed with AuRico's conclusion of no residual impacts to wildlife and stated that a cumulative effects assessment should be conducted to effectively address and manage for impacts to the ecosystem as a whole. In particular, HRFN was concerned about the potential for cumulative impacts to fish, moose, caribou and water quality. HRFN noted the extensive

level of industrial development within Treaty 8 territory and associated incidental impacts of development, including the creation and use of access roads resulting in increased competition for resources, and compromised ability to engage in cultural practices when harvesting resources in Treaty 8 territory.

EAO directed AuRico to respond to the noted HRFN comments and sent AuRico's responses to HRFN and asked if the responses were adequate and if they had any further comments. EAO did not receive any further comments from HRFN. EAO is satisfied that the consultation efforts with HRFN by both AuRico and EAO have been reasonable and appropriate to the nature of HRFN's concerns and potential impacts to HRFN arising from the KUG Project.

In consideration of the information available to EAO, AuRico's proposed mitigation measures, proposed conditions of any EAC issued including a Wildlife Management and Monitoring Plan that would need to reflect FLNRO guidance regarding the protection of sensitive wildlife areas for ungulates, and include a caribou management and monitoring plan as a component plan as well as a Caribou Program, EAO's analysis of residual and cumulative effects on wildlife and wildlife habitat and Aboriginal peoples' CULRTP – as discussed in sections 3.5.3 and 10.3.3 of this report – the KUG Project is expected to have negligible impacts on HRFN's Treaty 8 right to hunt in the area of the KUG Project. These comments and EAO's conclusions are discussed in detail in Part C of this report.

10.3.1 Effects On The Health And Socio-Economic Conditions Of Aboriginal Peoples Related To CEAA 2012 5(1)(c)(i)

Backgroud

In relation to CEAA 2012 5(1)(c)(i), the environmental effects of the KUG Project on the health and socio-economic conditions of Aboriginal peoples, along with an overall conclusion, are summarized in Table 32.

The Health and Socio-economic VC evaluates impacts to the following sub-components and effect pathways (analysis of potential impacts to these sub-components is outlined in the tables below):

1. Physical health – air quality, noise, water quality, country foods quality;
2. Diet, nutrition and well-being – decrease in country foods quality and / or consumption levels;
3. Food security and household economics – decreased country food harvests / consumption and associated increase in household expenditures on store-bought foods; and

4. Land-based businesses – availability of fish and wildlife resources and associated effects on employment and income.

The Application does not provide information regarding how potential impacts to Aboriginal economic interests might affect sociological ones.

For this VC, the Application identifies potential interactions for TKN, WMFN, Gitxsan wilp Nii Kyap and MNBC. However, only TKN have identified any land-based businesses reliant on the RSA (see below in this section). Accordingly, the Application does not assess impacts to Gitxsan wilp Nii Kyap, WMFN and MNBC for effects to land based businesses.

Members of the First Nations represented by TKN hunt, fish, trap and gather plants for food and medicine in the LSA and RSA. Some of the key resource harvesting locations for TKN include Thutade and Amazay lakes and surrounding areas (in the LSA), the head of the Ingenika River, Firesteel River, along the Finlay River and Moose Valley (all in the RSA; see Figure 20.4-5 of the Application for locations of CULRTP in the RSA). The Application states that there are 14 traplines overlapping the RSA, 13 of which are registered to members of the First Nations represented by TKN. The entire LSA is within a trapline registered to a family from TLFN (trapline # TR0739T006). The Application provides the following information on registration of traplines in the RSA (see section 4.4 of Appendix 17-A for further details):

- TR0739T006 (81% of trapline area in RSA) – 13 members of TLFN
- TR0739T003 (100% of trapline area in RSA) – 1 member of TKD
- TR0740T005 (100% of trapline area in RSA) – 3 members of KwN
- TR0739T008 (99.9% of trapline area in RSA) – 6 members of KwN
- TR0740T006 (99.8% of trapline area in RSA) – 5 members of KwN
- TR0739T002 (99.2% of trapline area in RSA) – 1 member of TKD

The Application states that none of the publicly available information sources provide specific details on resources harvesting areas in the LSA or RSA for Gitxsan wilp Nii Kyap or WMFN. However, based on the preferred territory of the Application notes that WMFN may use the RSA for resource harvesting. The MNBC UOS includes only one resource harvesting location and activity within the KUG Project LSA or RSA, a ptarmigan harvest site near the Toodoggone River in the RSA (see section 10.3.3 on potential impacts to CULRTP for assessment on potential impacts to MNBC)[26]. The Application states that the MNBC UOS indicates many fishing, hunting and gatherings

[26] At its closest point to the KUG Project, the Toodoggone River is approximately 30km north of the subsidence zone. The Application does not provide information on the specific location of the ptarmigan harvest side near the river.

sites within 200 km of the KUG Project, referred to as a “buffer zone”, but that these are outside of the LSA and RSA (the specific locations of these sites were not provided to AuRico).

In terms of country food consumption, the Application notes that members of First Nations represented by TKN fish for Dolly Varden, rainbow trout, bull trout and suckers with the RSA (amongst other species; members of TLFN fish for salmon and steelhead outside of the RSA).

According to the TLUS (Appendix 20-A, p60) large game such as moose, deer, mountain goat, thin horn sheep (stone sheep), and black bear are the most desired species for hunting. The Application also notes that caribou was hunted in the past in the RSA and KUG Project area, but is not currently harvested by TKN in the RSA as a voluntary response by TKN due to low caribou numbers.

TKN informed EAO that they do not hunt caribou as part of their traditional management approach (as opposed to a formal decision by each Nation) as TKN members have observed the decline of the species over time and stopped harvesting the species out of concern for its status. TKN noted the situation has socio-cultural implications as TKN has a stewardship prerogative to ensure the sustainability of healthy wildlife populations and that a failure to do so is contrary to this responsibility. TKD stopped harvesting caribou around the early-mid 1990s, KwN in the mid-late 1990s and TLFN in the late 1990s-early 2000s. TKN advised EAO that while there is not a TKN wide caribou conservation initiative *per se*, individual Nations are pursing various measures to assist in caribou recovery. For example, TKD has lead or participated in many caribou initiatives with their environmental consulting company, Cho Cho Environmental (and sometimes in partnership with FLNRO or other parties), including the below current projects:

- Outreach and Extension of Caribou Conservation in Tsay Keh Dene (November 2016): community engagement sessions on topics relating to environmental monitoring and stewardship within the territory;
- Northern Mountain Caribou Winter Habitat Restoration Program (2015-16): the goal of this project is to restore terrestrial lichen populations in the area of the Chase herd that was burned by wildfire in 2014, with the intention to seed forage in the burned region;
- Scott West Wildlife Camera Program: this project’s goal is to assess the likelihood of a remnant population of Scott herd Caribou on the west side of Williston Reservoir through community engagement and the use of remotely activated cameras; and
- Wolverine Caribou Herd Population Estimate: surveys of woodland caribou in the Wolverine caribou range, including studying mortality.

The TLUS identifies overhunting, contamination (in general) and roads as contributors to caribou decline. TKN have noted that local populations of caribou have stopped migrating through the area around the KUG Project, which they attribute to KS.

For additional information on fish, wildlife and plant species harvested by each Aboriginal Group, see tables 20.4-1, 20.4-2 and 20.4-3 of the Application, and table 20.4-4 for data on the percentage of individuals per Aboriginal Group that consume a particular country food. The Application does not include information on which, if any, species are more important than others for a particular Aboriginal Group.

Members of First Nations represented by TKN trap the following key species in the RSA: beaver, river otter, marten, mink, fisher, wolverine, lynx and squirrels. TKN gather a variety of plants, including rose hips, lingonberries, high-bush cranberries, soapberries, strawberries, raspberries, huckleberries, blueberries, kinnikinnick and crowberries; in addition to medicinal plants such as juniper and Indian hellebore.

The Application includes a quantitative HHRA that evaluates the current human health risk from different environmental sources (consumption of country foods, inhalation of air, drinking of surface water, and ingestion of, and dermal contact with, soil) and predicts impacts to this risk level from the KUG Project. The country food consumption characteristics (intake amounts, frequencies and food species) used in the HHRA are based on the First Nations Food Nutrition & Environment Study by Chan et al. (2011) and the TLUS study (Appendix 20-A of the Application). These levels are used because the Application assumes that Aboriginal groups would have higher levels of consumption of country foods (and therefore higher levels of contaminant exposure from these foods) than the general public. Therefore, the baseline and the KUG Project HHRAs are largely focused on Aboriginal individuals.

The baseline water quality of certain water courses is already affected by pre-existing influences (e.g. elevated levels of some metals such as Fe and Cu due to natural sources in East and Central Cirque Creeks; and elevated Se in waste rock creek due to KS); please see section 3.3 of this report for further details on water quality baseline conditions in various watercourses. Similarly, some country foods in the LSA have elevated baseline levels of certain COPC from a variety of sources. For example, there are currently high levels of Hg in bull trout in Thutade Lake, but AuRico states that this is not due to KS mining activities based on monitoring they conducted of streams flowing into Thutade Lake. The baseline HHRA in the Application (Appendix 18-A of the Application) indicates that baseline levels of Se in Bull Trout, Dolly Varden, Mountain Whitefish and Rainbow Trout are elevated. The Application notes that baseline is due to both natural sources and KS, but does not differentiate between the two. AuRico further

clarified that in some scenarios the elevations are due to KS (e.g. Dolly Varden in waste rock creek) and in others it is from natural sources (e.g., Bull trout in North Kemess Creek; Rainbow trout and Mountain whitefish in Kemess Lake; and Mountain whitefish in Amazay Lake). The HHRA in the Application incorporates median concentrations in each fish species from across the mine site, which includes both areas of naturally high Se and elevated Se due to Kemess South. The HHRA in this report focuses on the potential incremental human health risk from the KUG Project starting from post-KS current conditions. EAO did not conduct an assessment of any potential changes to human health risk that might have occurred due to KS operations.

The baseline HHRA indicates that there is an existing slightly elevated human health risk in toddlers from As, B, Se, TI, Al, Cr, Hg, and MeHg; and to adults from B, Cr, MeHg (in general and sensitive populations), Se, TI, Al and Hg (i.e. HQ higher than 0.2, but less than 1; see the Health section of this report for further details)[27]. Concerning carcinogenic COPC, the Application does not indicate current risks to human health via the inhalation route. However, there is a potential existing risk to human health from As through ingestion as the ILCR is $2.1x10^{-5}$ compared to the acceptable benchmark of ($1.0x10^{-5}$; see section 5 of this report for further details). EAO does not predict any residual or cumulative effects to human health risk as a result of the KUG Project.

TKN operate the following land-based businesses in the RSA:

- Kwadacha Outfitters (KwN): Outdoors and tourism services. Guided hunting focusing on stone sheep, grizzly bears, moose and mountain goat in the traditional territory of KwN. Guided fishing via the division of Kwadacha Outfitters called “Fishing Adventures” on the northern reaches of the Finlay River.
- Kwadacha Elders’ Dune Tiyah Society Tea (KwN): Traditional herbal teas sold online. The primary plant harvested is Labrador tea (*rhododendron tomentosum*). The tea is harvested in the mountainous areas of the KwN territory which overlap the RSA.
- Tsay Kay Dene Outfitters (TKD): Guided hunting primarily in Rusell Range and Cake Lake for mountain goat, sheep, moose, grizzly bear, black bear and wolf. Guided fishing for Artic grayling, bull trout, kokanee, lake trout, rainbow trout and Rocky Mountain whitefish. The main lodge for this company is at Fishing Lakes (in the RSA).
- Claw Mountain Outfitters (KwN and TKD): KwN and TKD purchased Claw Mountain Outfitters in 2016, which will be used for hunting and recreational tourism. As the company was recently purchased by the two Aboriginal groups there was no information at the time of writing regarding its particular activities.

As noted above, there are traplines registered to members of TKN First Nations in the

[27] For non-carcinogenic COPC, Health Canada suggests that a HQ of less than 0.2 indicates that the exposure does not pose a significant health risk to human receptors.

RSA. However, the Application states that there is poor data regarding the numbers and values of furs sold.

AuRico has signed an agreement with the holder of the trapline registered to a member of TLFN that overlaps the entire LSA.

Residual Effects Assessment

Table 32: Health and Socio-Economic Conditions of Aboriginal Peoples Sub-Component 1 – Physical Health

Potentially Impacted Aboriginal Peoples:

Potential physical health effects would largely be to TKN who use the LSA and RSA for resource harvesting and cultural purposes. Members of MNBC, WMFN and Gitxsan wilp Nii Kyap may also use the area and be affected.

Key Mitigations Identified by EAO	Predicted Residual Effects
Air quality - Mitigation • Implementing energy efficiency measures, installing emission control systems on stacks and on relevant ventilation systems, and ensuring proper equipment maintenance; • Institute a non-idling policy for KUG Project vehicles; • Fugitive dust suppression measures (e.g., wetting work areas and roads, installing windbreaks, using dust shields); • Control of general access to mine site to limit human health exposure to air, drinking water, soil and noise impacted by the KUG Project; • Mitigations to reduce potential PM2.5 concentrations; • Monitoring of metal contaminants contained in fugitive dust at human health receptor locations (including the worker camp) and mitigation to address effects identified by a QP. Monitoring must include baseline sampling and comparison to appropriate health based ambient air quality thresholds;	Air quality – Predicted Residual Effects on Physical Health All predicted air quality levels would be within current provincial Ambient Air Quality Objectives. EAO does not predict residual effects to physical health through air quality.

Key Mitigations Identified by EAO	Predicted Residual Effects
• Retrofitting of older engines, as required in BC for models manufactured between 1989 and 1993 that weigh over 8,200 kilograms (BC Ministry of Transportation and Infrastructure 2014); • Use of low-sulphur diesel in all equipment, as required by law; • Use of electric powered equipment in the underground where practical, reducing the overall volume of exhaust emissions; and • Procurement policies to identify fuel and equipment specifications.	
<u>Noise - Mitigation</u> • proper maintenance and operation of equipment to reduce noise; • implementation of site procedures to minimize noise, e.g., turning off equipment not in use, keeping doors closed; and • loud procedures will be conducted indoors, where practical, and enclosures, berms, acoustic screening, and shrouding where stationary sources require control will be identified.	<u>Noise – Predicted Residual Effects on Physical Health</u> The predicted levels of noise are below guideline values from the Mining Code at the camp bunkhouse (the nearest human receptor location). Noise from blasting would be below the threshold for the assessment of human disturbance associated with blasting events. EAO does not predict residual effects to physical health through noise.
<u>Water quality - Mitigations</u> • Water management to reduce effects on water quality (see Table 30); • Ensuring that Se concentrations of the discharge to Waste Rock Creek from the KUG Project TSF during post-closure would not incrementally increase Se concentrations in Waste Rock Creek; • Water flow management to reduce run-off, sedimentation and effects on water quality (see Table 30); and • Monitoring and adaptive management to address water quality effects of the	<u>Water quality – Predicted Residual Effects on Physical Health</u> The HHRA does not predict residual effects to human health through the consumption of surface water in the RSA. MNBC expressed concerns that the EA poorly addressed the need to monitor Waste Rock Creek for Se levels although noted that this was specified in the federal conditions. EAO notes the proposed provincial

Key Mitigations Identified by EAO	Predicted Residual Effects
KUG Project. AuRico will be required to treat the effluent from the KUG Project TSF for metals and Se to meet WQG or SBEB (see Table 30).	condition regarding Se concentrations in Waste Rock Creek. EAO does not predict residual effects to physical health through water quality.
<u>Country foods quality – Mitigations</u> • All water and air quality mitigations listed above; • Restriction of Aboriginal Group and public access to the KUG Project and KS site to minimize the collection of country foods in areas with greatest potential for country food contamination (see the section on CULRTP below for further information on restricted use area); and • Fish and Aquatic Effects Monitoring Plan requiring monitoring of concentrations of bioaccumulative contaminants in bull trout in Thutade Lake; Mitigation measures to protect vegetation and soil quality: • Design facilities to control chemical /fuel/oil spillage, and regular maintenance of equipment to avoid leaks; • Spill response equipment and procedures in place; and • Remediate contaminated soil.	<u>Country foods quality – Predicted Residual Effects on Physical Health</u> The conservatism of the HHRA is such that the very small predicted increases in risk for some COPCs are unlikely to occur, and it does not predict residual effects to human health from the KUG Project through multiple pathways, including country foods. EAO does not predict residual effects to physical health through changes in country food quality.

Table 33: Health and Socio-Economic Conditions of Aboriginal Peoples Sub-component 2 - Diet, Nutrition and Well-Being

*Potentially Impacted Aboriginal Peoples***:**

Potential effects would largely be to TKN who use the LSA and RSA for resource harvesting and cultural purposes. Members of MNBC, WMFN and Gitxsan wilp Nii Kyap may also use the area and may be affected.

Key Mitigations Identified by EAO	Predicted Residual Effects
<u>Country food quality – Mitigations</u> • See mitigation measures listed under the Physical Health section above for country foods.	<u>Country foods quality – Predicted Residual Effects</u> • See predicted residual effects listed under the Physical Health section above for country foods.

<u>Country foods consumption – Mitigations</u>
 	
Key mitigation measures related to the perception of decreased country food quality include the following:
 	
• Establish a comprehensive surface water monitoring program;
• Monitoring of water quality in Amazay Lake;
• Fish and Aquatic Effects Monitoring Plan to monitor bioaccumulative contaminants in fish in Thutade Lake;
• Adaptive management to address water quality effects of the KUG Project if those effects:
  o are not mitigated to the extent contemplated in the Application; or
  o are not predicted in the Application;
• Treatment of effluent discharge water from the KUG Project TSF for metals and Se;
• Requirement that Se concentrations of the discharge to Waste Rock Creek from the TSF during closure would not incrementally increase Se concentrations in Waste Rock Creek;
• Aboriginal Monitors to conduct environmental monitoring and report back to TKN communities; and
• Environmental Monitoring Committee to provide a venue for TKN to have input on mine development, mitigation and monitoring measures and adaptive management.
	<u>Country foods consumption Predicted Residual Effects</u>
	
	EAO does not predict that the KUG Project would have residual effects on human health risk through the consumption of country foods (see above). However, there might be perceptions of country food contamination that may cause Aboriginal peoples to consume less country foods (and perhaps more processed foods, which could be damaging to health). The general area has already been affected by KS (which had a 1,900 ha footprint), and the KUG Project could prolong the effects of impacts to the perception of contamination (and any related changes to consumption patterns).
	
	TKN have indicated that they are concerned about the effects of the KUG Project on the quality and healthfulness of country foods. The perception in these communities is that the KUG Project could cause the quality of country foods to decline. Additionally, TKN notes that this concern is cumulative with other adverse effects on the perception of country food quality from other natural resource activities in their territories.
	
	MNBC expressed concern that the KUG Project could result in increased environmental concentrations of COPCs, which may accumulate through soils and water to wildlife (e.g., moose) and fish. MNBC was of the view that this issue was inadequately addressed in the EA. MNBC stated that monitoring and assessing of

Key Mitigations Identified by EAO	Predicted Residual Effects
	COPCs may need to be added to the provincial and federal conditions. EAO did not predict a residual adverse effect to wildlife from COPCs or to human health from the KUG Project (which included consideration of country foods). However, EAO recommends a federal follow-up program including monitoring to verify AuRico's predictions in the EA and track any potential increases in COPC concentrations in the environment and inform additional mitigation. Concerning potential changes to harvesting patterns, the Application notes that while the KUG Project would impact some wildlife habitat and movement and therefore the location of hunting activities, this is not predicted to have a residual effect on hunting or trapping activities as the effects to wildlife would be local in extent and AuRico states that other harvesting areas are available in the RSA. The Application does not provide information suggesting that the KUG Project area is a preferred resource harvesting area, as compared to other areas in the RSA. TKN have noted that as they would be excluded from the KUG Project and KS footprint and buffer areas and this would reduce the area in which they could harvest resources in their territories. Additionally they have indicated that due to other past and current natural resource based activities in the broader region (e.g. forestry, the Williston dam) their ability to harvest resources in their territories has been decreased. TKN stated that their ability to harvest certain resources in their territories is already moderately to highly constrained (e.g., for fish, caribou, moose, mountain goat, stone's sheep, and grizzly bear) and that the KUG Project would

Key Mitigations Identified by EAO	Predicted Residual Effects
	have negative impacts on this ability that range in severity by species. In consideration of potential changes to country food consumption due to perceptions of country food quality, decreased areas in which to harvest food, and TKN's view on the state of alternate resources outside of the restricted access area (see previous paragraph) EAO concludes that there would be a predicted residual effect to country foods consumption from the KUG Project.

Table 34: Health and Socio-Economic Conditions of Aboriginal Peoples Sub-component 3 - Household Economy and Food Security

*Potentially Impacted Aboriginal Peoples***:**

Potential effects would largely be to TKN who use the LSA and RSA for resource harvesting and cultural purposes. Members of MNBC, WMFN and Gitxsan wilp Nii Kyap may also use the area and be affected.

Key Mitigations Identified by EAO	Predicted Residual Effects
EAO did not identify any mitigation measures specifically related to household economy and food security beyond the general wildlife mitigation measures identified in Table 30.	The Application predicts that there would be no residual effects to household economy and food security. This is based on the predictions of no residual effects to country food harvesting because predicted effects to wildlife are restricted to the LSA and hunting practices would continue outside of the LSA. Also, the KUG Project is not predicted to reduce wildlife populations or country food quality, and there are alternative hunting locations available. In consideration of the views of Aboriginal groups (see assessment of "Diet, Nutrition and Well-Being Above) concerning perceptions of country food quality, reduction in area to harvest resources and availability of resources outside of the restricted access area for the KUG Project

Key Mitigations Identified by EAO	Predicted Residual Effects
	and KS, EAO predicts that there would be residual effects to household economy and food security.

Table 35: Health and Socio-Economic Conditions of Aboriginal Peoples Sub-component 4 - Land-Based Businesses

*Potentially Impacted Aboriginal Peoples***:**

Members of TKN own land based businesses and might be affected by the KUG Project

Key Mitigations Identified by EAO:	Predicted Residual Effects
• The Application notes that Trapline TR0739T006 (registered to 13 members of TLFN), overlaps the entire LSA and includes Thutade Lake and portions of the Thorne Creek, Moose Vale Creek, Johanson Creek and Niven River drainages. AuRico signed an agreement with holders of the trapline in 2014 to mitigate potential environmental and economic effects to their trapline, including access restrictions. Previous agreements were signed with these trapline holders for KS. The Application does not provide any further details regarding potential effects of the KUG Project to the trapline holders.	There are two TKN guide outfitter operations in the RSA; residual effects to wildlife would be limited to the LSA and these outfitter licences do not overlap the LSA. Accordingly, these operations would not be impacted by the KUG Project. Similarly, except for the one mentioned, traplines are all located outside the LSA, within the RSA where they would not be impacted by localized wildlife effects. There are no predicted residual effects to plants or fish from KUG Project outside of the LSA, and therefore no predicted residual effects to the KwN elders' tea business or guided angling operations (which operate outside of the LSA but within the RSA). EAO does not predict any residual effects to land-based businesses.

<u>Cumulative Effects Assessment - Health and Socio-economic Conditions of Aboriginal Peoples</u>

The HHRA does not predict any residual, and therefore not any cumulative effects, to human health from the KUG Project (i.e. through country foods, air or water quality). TKN's view is that there would be additive spatial and temporal effects from the KUG Project on the existing perception of contamination of country foods and on existing restrictions to access to these foods. Both of these pathways of effects could cause

changes to actual consumption patterns and amounts, which could cause effects to TKN diet, nutrition and well-being if TKN members are choosing less healthy options as replacements to country foods as well as spending less time on the landbase conducting traditional activities. Additionally, these pathways could impact household economy and food security to the extent that TKN members rely financially on country foods instead of more expensive store bought foods. The Application does not contain data on the significance of the contribution of country foods to TKN diets or household economies (although table 20.4-4 includes data showing that the majority of TKD respondents in a particular study consumed trout, moose, blue huckleberries and soapberries over a one year period). However, TKN have communicated to EAO that country foods continue to be a very important form of sustenance for TKN members and are a preferred option to expensive processed food. TLFN informed EAO that TLFN members rely heavily (80% or higher) on country foods as their primary source of protein.

Overall Conclusion

In consideration of TKN's views on perception of contamination and access, EAO predicts that the KUG Project could increase the perception of country food contamination and prolong this perception into the future, in addition to affecting the ability of Aboriginal groups to access a portion of their territories. EAO predicts that this might have residual and cumulative effects on diet, nutrition and well-being, and household economy and food security, and therefore on the health and socio-economic conditions of Aboriginal peoples. EAO is proposing the following EAC conditions to mitigate impacts on the perception of contamination of country foods, which EAO feels would help to restore confidence in the health of country foods by reducing perceptions of contamination and encourage resource harvesting:

- Requirement for AuRico to treat the effluent from the KUG Project TSF for metals and Se to meet WQG or SBEB;
- Fish and Aquatic Effects Monitoring Plan requiring monitoring of concentrations of bioaccumulative contaminants in bull trout in Thutade Lake;
- Amazay Lake Monitoring Plan requiring monitoring of water quality of Amazay Lake and groundwater to detect groundwater movement from the underground cave/subsidence zone towards Amazay Lake to ensure there are no adverse effects on Amazay Lake;
- Ensure that there are no incremental effects from the KUG Project on Se in Waste Rock Creek from the KUG TSF;
- Aboriginal Monitors employed by AuRico conduct environmental monitoring and report back to TKN communities; and

- Environmental Monitoring Committee to provide a forum for information sharing, and discussion of topics of interest to TKN to ensure that all parties are involved in the ongoing development of the mine, mitigation and monitoring measures and adaptive management.

In addition to the potential adverse impacts from the KUG Project, EAO also predicts that the KUG Project would provide a variety of socio-economic benefits to Aboriginal peoples (which could also positively impact health outcomes). For example, AuRico has committed to hiring qualified members of TKN and other Aboriginal groups and to employing an Aboriginal Liaison Officer who would engage with prospective Aboriginal applicants and provide information about employment opportunities, qualifications and details of working at the mine site. This officer would also engage with workers and their families to identify and manage well-being issues such as financial management, job-related stress or workplace conflict.

Additionally, the Province has committed to negotiate an ECDA for the KUG Project with each of the TKN First Nations. Under this agreement, the Province would outline how it intends to share mineral tax revenues from the KUG Project with the TKN First Nations if the KUG Project is developed and operated. Negotiations on the ECDA are ongoing and are led by TKN and provincial representatives. TKN's view is that the ECDAs for each of the TKN First Nations would contribute to accommodation for the KUG Project effects.

Considering the HHRA, which does not predict any residual effects to human health from the KUG Project, the mitigation measures listed above to reduce the perceptions of impacts to country foods, and the ECDA being negotiated between TKN and the Province, EAO concludes that the predicted residual and cumulative effects to the health and socio-economic conditions of Aboriginal peoples would not be significant.

10.3.2 Effects on Aboriginal Peoples' Physical and Cultural Heritage, and Effects on Historical, Archaeological, Paleontological or Architectural Sites or Structures Related to CEAA 2012 5(1)(c)(ii) and (iv)

Background

In relation to CEAA 2012 5(1)(c)(ii) and (iv), the effects of the KUG Project on Aboriginal peoples' physical and cultural heritage, and effects on historical, archaeological, paleontological or architectural sites or structures along with an overall conclusion, are summarized in Table **36**.

The physical and cultural heritage VC (including any structure, site or thing that is of historical, archaeological, paleontological or architectural significance) evaluates impacts to the following sub-components and effect pathways:

- Sacred sites and objects: including burial sites, culturally significant landscapes and other places of cultural significance that could be lost to altered by the KUG Project and related environmental changes;
- Habitations and trails: cultural heritage sites and features such as camps, cabins and trails (which may not be designated archaeological sites) that could be lost to, altered by, the KUG Project and related environmental changes;
- Intangible cultural heritage: may include the sharing of stories and legends; teaching of traditional knowledge/skills; oral history; place names; and spiritual practices (e.g. dreaming, ceremonies, rituals). These practices or knowledge may be lost or altered by the KUG Project and related environmental changes (e.g. diminished quality of experience using lands and resources due to noise, visual quality, air quality or human presence).

For this VC, the Application identifies potential interactions for TKN, WMFN, Gitxsan wilp Nii Kyap and MNBC. Since WMFN and MNBC have not identified habitations, trails, or sacred sites in the LSA or RSA, AuRico screened them out of the assessment of effects to these places. However, with regard to intangible cultural heritage, which is linked both to harvesting and the use of areas for spiritual or ceremonial purposes, AuRico included MNBC and WMFN in this assessment, since the assessment conservatively assumes that their members may use the RSA for harvesting.

HRFN provided comments during Application review expressing their interests in cultural heritage around the KUG Project area; however no specific details of their interests were provided. As such, HRFN remained screened out of the CEAA 2012 5(1)(c)(ii) and (iv) assessment. HRFN indicated they were not adequately consulted in the development of the heritage effects assessment and the identification of cultural and spiritual sites within the RSA or LSA. AuRico responded that the level of consultation with HRFN was delegated as set out in the section 11 Order and guidance from EAO. EAO and AuRico's engagement with HRFN is described in Part C of this report. During pre-Application, AuRico provided HRFN with drafts of AuRico's report describing the assessment of potential effects of environmental change caused by the KUG Project on HRFN, in accordance with section (5)(1)(c) of CEAA 2012, for review and comment. No comments were received.

Effects on physical heritage resources protected under the BC HCA, including archaeological sites, are assessed in section 6 of this report. This section considers the potential effects of physical heritage that are not automatically protected under the HCA, as well as on non-physical or intangible heritage aspects of Aboriginal cultures.

The Application identifies two types of potential effects to physical and cultural heritage: a direct, physical effect to a place or thing, and a less tangible effect on a custom, attribute, or activity. The latter effect can be caused by the former, as well as by the alteration of harvesting practices (section 3.6) or changes to the consumption of country foods (section 5).

Sacred Sites and Objects

TKN have identified burial sites at the northeastern end of Thutade Lake, just before its outlet into the Finlay River. Two known burial sites and a known cremation site are located at Amazay Lake (in the LSA). Burial sites are also located in Moose Valley (which is on the southwest border of the RSA; see Figure 20.4-5 of Application). The Application notes the importance to TKN of protecting heritage and traditional use areas in the vicinity of the KUG Project, including the protection of cultural values associated with Amazay Lake, Thutade Lake and Finlay River.

TKN identified Thutade Lake (in the LSA) and Cascadero Falls (just outside of the LSA) as important locations for summer social gatherings. Amazay Lake and Moose Valley were also identified as places where they hold these kinds of gatherings. In addition, the Application identifies the following sites:

- Thutade Lake is associated with the acquisition of spirit helpers and dreams, an important aspect of Tse'khene (Sekani) culture;
- spirit questing is conducted at Amazay Lake by members of TKN First Nations; and
- Kemess Lake is known as a significant cultural area for TKN, although the Application states that details of its significance are not clear.

The Application states that Thutade Lake is reported to be the site of a historical territorial conflict between the Tse'khene and the Gitxsan, and associated locations along the lake include the place where the Tse'khene were camped at the time of a battle, the location of the battle, and an associated burial. These places are important to both the TKN and Gitxsan wilp Nii Kyap. The button blanket belonging to the Chief of wilp Nii Kyap commemorates the peace settlement that was made following the battle. It is a physical heritage object that is directly related to the LSA.

The Application states that the KUG Project would not result in any physical alteration of Thutade Lake, Amazay Lake, Kemess Lake, Finlay River, or Cascadero Falls, and no KUG Project components or infrastructure would be built in these areas. No changes to water quantity or quality are predicted at these locations (Section 3.3). Therefore, AuRico does not predict direct effects to sacred sites in these locations. AuRico also does not predict indirect effects to sacred sites in these locations (i.e. no changes in the

quality of experience using lands and resources). The Application concludes that the symbolism of the button blanket will not be affected by the KUG Project since no changes are anticipated to the physical geography or water quality of Thutade Lake, Amazay Lake or Cascadero Falls. Therefore AuRico does not anticipate effects to sacred objects associated with these locations.

Habitations and Trails

According to the TKN TLUS, numerous camps and cabins are located throughout the RSA, in particular around Thutade Lake. McConnell Creek (RSA), Black Lake (RSA), Aiken Lake (RSA), Cheni Mines (RSA), Grizzly Pass (RSA), Whistler Basin (outside the RSA), Shasta Mine (RSA), Sustut (outside the RSA), Thorne Lake (RSA), and Cascadero Falls (just outside the LSA) were recognized as places people have recently spent time in tents or cabins (Appendix 20-A of the Application).

The Application states that a historic trail ran from Finlay River to Thutade and Tatlatui lakes, where there were trails west across the Continental Divide into Gitxsan territory in the headwaters of the Stikine and Skeena rivers. Today, trails run along both sides of Thutade Lake and the west side of Amazay Lake. Trails also run from Moose Valley to Thorne Lake to Attichika Creek, and from Toodoggone Creek to the Caribou Hide trail (Appendix 20-A of the Application). One trail, which runs overland from the upper Skeena River along Birdflat Creek and the Niven River to Thutade Lake, appears to be within the RSA. This trail would have been used by the Sekani people living at Bear Lake (now at Takla Lake) as well as the Gitxsan further down the Skeena River.

The exact locations of many of these habitations and trails are not known with certainty. However, no trails or habitation sites have been identified within the KUG Project footprint, where the majority of KUG Project components and infrastructure are located. AuRico has committed to engage with Aboriginal groups to identify and ground-truth any habitations or trails that could be affected by KUG Project activities and states that measures to avoid or minimize effects to these places would be implemented at that time. The Application concludes that with these measures in place, no residual effects to habitations or trails are anticipated.

Intangible Cultural Heritage

The Application describes aspects of intangible cultural heritage that may be affected by environmental changes caused by the KUG Project, noting that some intangible features – such as the role of the Thutade Lake area in oral history of TKN and Gitxsan – would not be affected by the KUG Project and are therefore not considered further. Intangible cultural heritage is tied to CULRTP (see section 10.3.3 below). AuRico only predicted residual effects to CULRTP for TKN, in relation to potential changes to access

compared to pre-disturbance conditions and hunting success as a result of decreased availability of wildlife resources in the LSA. AuRico rated the effect of changes in hunting success as not significant, due to the fact that the magnitude of impact on wildlife is considered minor and will be limited to the LSA. The KUG Project is located on a brownfield mine site with most of the mining occurring underground. AuRico predicted changes in the access to lands and resources compared to pre-disturbance conditions, but not to quality of experience using lands and resources. Despite access restrictions, the Application states that the use of culturally important areas (such as Thutade and Amazay Lake) and, by extension, the spiritual and cultural values associated with these places (including their role in oral history), would not be affected by the KUG Project as they are outside of the restricted access area (i.e. these areas would also not be physically altered or affected by KUG Project infrastructure or activities) and the quality of experience is not predicted to be affected.

TKN feel that the values of cultural areas have already been impacted by development of access that came with the ORAR and would continue to be affected by maintenance of access of the ORAR from the KUG Project (e.g. road maintenance and clearing in the winter). TKN also notes that the enjoyment of cultural areas has been affected by the perception of changes to environmental health of the region due to past activities (e.g. KS) and would continue with the KUG Project.

Changes to traditional land use patterns in the LSA or RSA may hinder the ability of TKN to apply their language skills and transfer language and knowledge between elders and youth.

The Application states that no potential effects to intangible cultural heritage associated with harvesting activities are identified for Gitxsan wilp Nii Kyap, WMFN, or MNBC.

Residual Effects Assessment

Table 36: Aboriginal Physical and Cultural Heritage and Effects On Historical, Archaeological, Paleontological or Architectural Sites or Structures Sub-component 1 - Sacred Sites and objects

Potentially Impacted Aboriginal Peoples:

TKN, and Gitxsan wilp Nii Kyap

Key Mitigations Identified by EAO	Predicted Residual Effects
• Heritage Chance Find Procedure; • Site orientation and training of construction personnel on HCA	The KUG Project would not result in any physical alteration of Thutade Lake, Amazay Lake, Kemess Lake, Finlay River,

Key Mitigations Identified by EAO	Predicted Residual Effects
requirements would be conducted to promote staff awareness of the procedures for responding and reporting new sites; • Heritage Resources Management Plan including the following mitigation measures: o Archaeological sites within 0-50 m of ground altering activities would be marked as 'no work zones' and would be flagged or temporarily fenced; o Archaeological sites within 50-150 m of project components would be marked as 'no work zones' and monitored to ensure no effects to these sites; o If impacts are anticipated, or observed, then additional mitigation may be implemented which may include systematic data recovery; and o Monitoring of 'no work zones'.	or Cascadero Falls and no changes to water quantity or quality are predicted at these locations. EAO does not predict residual effects to sacred sites and objects.

Table 37: Aboriginal Physical and Cultural Heritage and Effects On Historical, Archaeological, Paleontological or Architectural Sites or Structures Sub-component 2 - Habitations and Trails

Potentially Impacted Aboriginal Peoples:

TKN, and Gitxsan wilp Nii Kyap

Key Mitigations Identified by EAO	Predicted Residual Effects
AuRico has committed to engage with	No trails or habitation sites have been

Key Mitigations Identified by EAO	Predicted Residual Effects
Aboriginal groups to identify and ground-truth any habitations or trails that could be affected by KUG Project activities and implement measures to avoid or minimize effects to these places.	identified within the KUG Project footprint. One trail, which runs overland from the upper Skeena River along Birdflat Creek and the Niven River to Thutade Lake, appears to be within the RSA. This trail would have been used by people living at Bear Lake (now at Takla Lake) as well as the Gitxsan further down the Skeena River. EAO does not predict residual effects to habitations and trails.

Table 38: Topic: Aboriginal Physical and Cultural Heritage and Effects On Historical, Archaeological, Paleontological or Architectural Sites or Structures Sub-component 3 - Intangible Cultural Heritage

Potentially Impacted Aboriginal Peoples:

TKN

Key Mitigations Identified by EAO	Predicted Residual Effects
The Application does not commit to any mitigation measures specifically related to this VC. EAO is proposing an Aboriginal Cultural Awareness and Recognition EAC condition that would require AuRico to work with Aboriginal groups to identify opportunities for cultural awareness and recognition and offer opportunities to Aboriginal groups that include holding ceremonies, installing signage, executing cultural protocols, recognizing cultural heritage, and providing cultural awareness training to KUG Project personnel.	AuRico only predicted residual effects to CULRTP for TKN, in relation to changes to access compared to pre-disturbance conditions and potential changes to hunting success as a result of decreased availability of wildlife resources in the LSA due to a variety of residual effects to wildlife from the KUG Project (disruption of movement, habitat loss and alteration, impacts from attractants, sensory disturbance, and direct and indirect mortality) to a variety of species. AuRico assessed potential changes to access as not significant, due to the moderate magnitude and the effect would be limited to the KUG Project site. AuRico assessed potential changes to hunting success as not significant, due to the minor magnitude of impact on wildlife and the effect would be limited to the LSA.

Key Mitigations Identified by EAO	Predicted Residual Effects
	The KUG Project is located on a brownfield mine site with most of the mining occurring underground. AuRico predicted changes in access to lands and resources compared to baseline, but not quality of experience using lands and resources. Despite access restrictions, the use of culturally important areas (such as Thutade and Amazay Lake) and, by extension, the spiritual and cultural values associated with these places (including the role of Thutade Lake area in oral history of TKN and Gitxsan), would not be affected by the KUG Project as they are outside of the restricted access area. No potential effects to intangible cultural heritage associated with harvesting activities are identified for Gitxsan wilp Nii Kyap, WMFN, or MNBC. TKN feel that the quality of experience of using culturally important areas in the region has already been affected due to increased access to the region since the original construction of the ORAR. TKN also feel that this effect would continue and potentially increase with the KUG Project due to possible increases in the use of the area outside of the Restricted Area for hunting, fishing and recreational purposes (by non-employees), caused by increased traffic along the ORAR (due road maintenance and winter clearing from the KUG Project). EAO predicts that there would be residual effects to intangible cultural heritage due to the possibility of increased human presence in culturally important areas.

EAO is not aware of any identified physical or cultural sites (including any structure, site or thing that is of historical, archaeological, paleontological or architectural significance to Aboriginal peoples) that may be directly impacted by the activities of the KUG Project including sensory impacts to spiritual practices with the KUG Project footprint and buffer areas. However, key mitigation is proposed to address any potential impacts on undocumented sites.

TKN has identified potential cumulative effects of the KUG Project on intangible cultural heritage through the effect of human presence and its impact on the quality of experience of using culturally important areas.

Overall Conclusion

The only potential residual effect that EAO is predicting for Effects on Historical, Archaeological, Paleontological or Architectural Sites or Structures is due to potential impacts on the quality of experience for cultural areas. EAO notes that the KUG Project mine site and culturally important areas in its vicinity (e.g. Thutade Lake) are over 400 km away from the district of Mackenzie along the ORAR. As this is a long distance to travel for a hunter, angler or recreationalist (i.e. for a non-staff person accessing the area for recreational purposes), EAO considers the magnitude of this particular pathway of effect to be low.

Considering the above analysis, which predicts only one low magnitude residual effect to the quality of experience of cultural places, and with the implementation of key mitigation measures identified by EAO as noted in the above tables, EAO is satisfied that the proposed KUG Project would not likely have significant adverse residual or cumulative environmental effects on physical or cultural sites (including any structure, site or thing that is of historical, archaeological, paleontological or architectural significance to Aboriginal peoples).

10.3.3 Effects on Aboriginal Peoples' Current Use of Lands and Resources for Traditional Purposes Related to CEAA 2012 5(1)(c)(iii)

Background

In relation to CEAA 2012 5(1)(c)(iii), the effects of the KUG Project on Aboriginal peoples' CULRTP, along with an overall conclusion, are summarized in Tables 39-41.

The CULRTP VC evaluates impacts to the following sub-components and effect pathways:

- Fishing – environmental effects on fish populations, displacement of fishing activities, changes to the quality of the experience;
- Hunting and trapping – environmental effects on wildlife populations, displacement of hunting and trapping activities, changes to the quality of experience;
- Gathering – environmental effects on harvestable plants and other harvests, displacement of gathering activities, changes to the quality of experience; and
- Use of culturally important areas – displacement of cultural or spiritual uses, changes to the quality of experience (see previous section for conclusions on this sub-component)

The Application notes that all four of these sub-components could be affected by the same effects pathways: change in access (and subsequent displacement of activities), change in the quality of the experience and change to the availability of the resource. The Application evaluates potential residual effects to each of these pathways (see Tables 39-41 below for a summary).

For this VC, the Application identifies potential interactions for TKN, WMFN, Gitxsan wilp Nii Kyap and MNBC.

Information on conditions for CULRTP for resource harvesting (hunting, fishing, trapping, and gathering) and access restrictions are provided in the sections above (see the introductory paragraphs to the section on “Effects of Change to Environment on Aboriginal Peoples Related to CEAA 2012 5(1)(c)” and “Effects On The Health And Socio-Economic Conditions Of Aboriginal Peoples Related Peoples Related To CEAA 2012 5(1)(c)(i))”). In terms of current use, the Application notes that TKN identified Thutade Lake, Cascadero Falls (just outside the LSA), Amazay Lake and Moose Valley as important places for social gatherings where people camp and share stories and information. Youth camps are also held at Johanson Lake. Thutade, Amazay and Kemess lakes are also known as important spiritual places for TKN. The Application states that Gitxsan wilp Nii Kyap visit Thutade Lake and the surrounding area to commemorate events in oral history, such as the battle between the Gitxsan and Tse’khene (Sekani) ethnolinguistic groups. The Application notes that the publicly available information does not include any specific information on CULRTP by the WMFN within the RSA or LSA. The WMFN was provided with AuRico’s analysis for their input but did not provide further information or comments to EAO during Application review.

CULRTP also includes past activities that are no longer being carried out due to external forces, but that could be expected to recommence should conditions change. TKN have noted that the west side of Thutade Lake (just outside the LSA) was an important caribou hunting area and that caribou used to migrate through the KUG

Project area in the past (before KS) more than they currently do. TKN do not currently hunt caribou in the KUG Project area because of the state of the species in the area (see discussion above in section 10.3.1 on TKN and caribou hunting), but it is likely that if caribou were to recover they would hunt it again in this area in the future.

EAO notes that the Province currently allows hunting of bull caribou in all of the WMUs[28] surrounding the KUG Project area. All of these WMUs have a "General Open Season" – five point bull (male) restriction for caribou (see footnote for exceptions)[29]. This means that any resident hunter has the opportunity to harvest bull caribou in the specified WMU given that it has a minimum of five points on one antler. In the Chase herd since the year 2000, an average of 2.3 bull caribou (or ~0.4% of the estimated Chase herd) have been harvested on an annual basis. FLNRO has indicated that overall, a 0.4% bull-only harvest rate in a population estimated at over 450 animals is within the sustainable harvest criteria used by the province. FLNRO has noted that the Province is currently reviewing caribou hunting regulations across recovery areas to assess if there is need for revised regulations.

Restrictions to accessing the general KUG Project area were put into place in 1996 when the KS started construction. The area of disturbance for the KS was 1,900 ha, of which 675 ha has been reclaimed (although the reclaimed areas would remain within the restricted access area for the public and Aboriginal groups if the KUG Project proceeds).

Residual Effects Assessment

Table 39: CULRTP Effect Pathway 1 - Displacement of Land Use Activities

Potentially Impacted Aboriginal Peoples:

TKN, WMFN, Gitxsan wilp Nii Kyap and MNBC.

Key Mitigations Identified by EAO	Predicted Residual Effects
Project Land Use & Access Restrictions – Key Mitigations: • The Application notes that Trapline TR0739T006 (registered to 13 members of TLFN), overlaps the entire	Project Land Use & Access Restrictions – Predicted Residual Effects: Including the 250 m buffer, the KUG Project would result in around 487 ha of new surface disturbance. This is 2.9% of

[28] WMUs are management units in BC established for efficient game management.
[29] There are exceptions in portions of two WMUs within the Spatsizi herd range, northwest of the KUG Project area (one of which is in the Spatsizi Plateau Wilderness park). In these two areas a Limited Entry Hunting only system is in place, which restricts the number of tags awarded to resident hunters through a draw system.

Key Mitigations Identified by EAO	Predicted Residual Effects
LSA and includes Thutade Lake and portions of the Thorne Creek, Moose Vale Creek, Johanson Creek and Niven River drainages. AuRico signed an agreement with holders of the trapline in 2014 to mitigate potential environmental and economic effects to their trapline, including access restrictions. Previous agreements were signed with these trapline holders for KS. The Application does not provide any further details regarding potential effects of the KUG Project to the trapline holders.	the LSA. The previous KS had 1,900 ha of disturbance (675 ha of which has been reclaimed). The additive effect of land disturbance from KUG Project and KS would cause a residual effect to land use. Additionally, access restrictions from KS would continue during the KUG Project and be slightly increased, lengthening the temporal impact of the restrictions implemented for KS. The total amount of land that would be restricted from access for Aboriginal groups and the public from the KUG Project and KS together would be approximately 8,538 ha (0.6% of the 1,455,180 ha RSA and 52% of the 16,560 ha LSA; See Figure 13 below). TKN notes that although almost 700 ha of the KS site has been reclaimed, this area is within the restricted access area so is not currently available to TKN to conduct traditional activities. Additionally, TKN feel that the restricted access needs to be considered with respect to their ability to conduct traditional activities in other areas of their territories, which they state have been diminished due to other natural resources activities (e.g. forestry, the Williston dam). EAO predicts that there would be residual effects to access due to the combined Restricted Area from the KUG Project and KS.
<u>Traffic – Key Mitigations</u> • Monitoring of road dust on the northern 168 km section of the ORAR where AuRico is the sole industrial user and adaptive management of road dust.	<u>Traffic – Predicted Residual Effects:</u> Increased industrial traffic from the KUG Project has the potential to affect current use of the landbase by direct displacement of traditional activities (e.g. through displacing resource harvesters from using areas along the ORAR). The highest level of traffic along the ORAR would be during operations, at 12 trucks per day. During

Key Mitigations Identified by EAO	Predicted Residual Effects
	KS, the daily average traffic was 16 trucks per day. Although the KUG Project would be a reduction in traffic when compared to KS, it would still prolong the length of time of presumably increased industrial traffic along the upper portion of the ORAR when compared to pre-KS levels (AuRico does not have traffic data from pre-KS). TKN notes that the KUG Project could also facilitate access along the ORAR due to ongoing maintenance to support mine access and transport of goods and winter clearing of the road. In consideration of TKN's concerns about potential impacts from traffic on the ORAR and in taking a conservative approach recognizing the lack of data on this subject, EAO predicts there would be residual effects on land use activities due to traffic from the ORAR.

Figure 13: Restricted Public Access for KS and the KUG Project

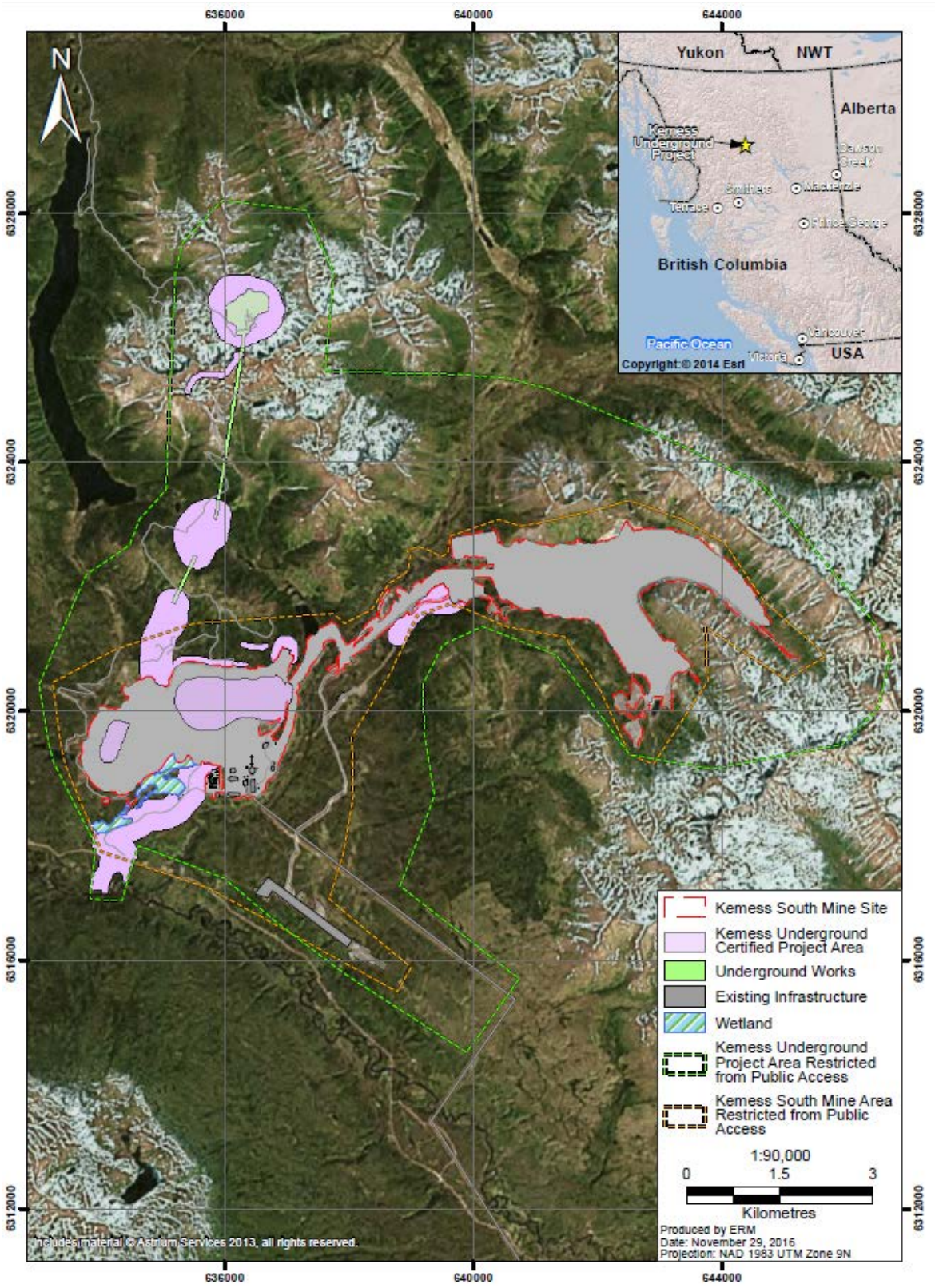


Table 40: CULRTP Effect Pathway 2 - Quality of Land Experience

Potentially Impacted Aboriginal Peoples:

TKN, WMFN, Gitxsan wilp Nii Kyap and MNBC

Key Mitigations Identified by EAO	Predicted Residual Effects
<u>Noise – Key Mitigations:</u> • Proper maintenance and operation of equipment to reduce noise; • Implementation of site procedures to minimize noise, e.g., turning off equipment not in use, keeping doors closed; and • Loud procedures will be conducted indoors, where practical, and enclosures, berms, acoustic screening, and shrouding where stationary sources require control will be identified.	<u>Noise – Predicted Residual Effects:</u> The predicted levels of noise are below guideline values from the Mining Code. Noise from blasting would be below the threshold for the assessment of human disturbance associated with blasting events. EAO does not predict any residual effects to the quality of land experience from noise from KUG Project activities.
<u>Visual Quality – Key Mitigations</u> There are no specific mitigations proposed for visual quality.	<u>Visual Quality – Predicted Residual Effects:</u> There is no view of the mine from key areas for CULRTP, such as Thutade Lake, Amazay lake, and Attichika Creek up to its confluence with Waste Rock Creek. Viewers could see the mountain on the KUG Project deposit from Amazay Lake, but as the mine would be underground, no infrastructure or facilities would be visible. Views of the new access corridor would largely be screened by forest cover (and 900 m of it would be via an access tunnel and therefore not visible). EAO does not predict any residual effects to the quality of land experience from visual quality.
<u>Air Quality – Key Mitigations</u> • Implementing energy efficiency measures, installing emission control systems on stacks and on relevant ventilation systems, and ensuring	<u>Air Quality - Predicted Residual Effects:</u> All predicted air quality levels would be within provincial Ambient Air Quality Objectives.

Key Mitigations Identified by EAO	Predicted Residual Effects
proper equipment maintenance; • Institute a non-idling policy for KUG Project vehicles; • Fugitive dust suppression measures (e.g., wetting work areas and roads, installing windbreaks, using dust shields); • Control of general access to mine site to limit human health exposure to air, drinking water, soil and noise impacted by the KUG Project; • Mitigations to reduce potential PM2.5 concentrations; • Monitoring of metal contaminants contained in fugitive dust at human health receptor locations (including the worker camp) and mitigation to address effects identified by a QP. Monitoring must include baseline sampling and comparison to appropriate health based ambient air quality thresholds; • Retrofitting of older engines, as required in BC for models manufactured between 1989 and 1993 that weigh over 8,200 kilograms (BC Ministry of Transportation and Infrastructure 2014); • Use of low-sulphur diesel in all equipment, as required by law; • Use of electric powered equipment in the underground where practical, reducing the overall volume of exhaust emissions; and • Procurement policies to identify fuel and equipment specifications.	EAO does not predict any residual effects to the quality of land experience from air quality.
<u>Human Presence – Key Mitigations</u> • Restricting employees from bringing firearms / harvesting equipment to site; and • Transporting workers to and from the KUG Project site by air will prevent their ability to harvest along the ORAR.	<u>Human Presence - Predicted Residual Effects:</u> At peak employment there would be around 450 people at the mine site. Employees would not be allowed or equipped to leave the mine site during off-site hours for recreation or harvesting activities. Also, as the mine site would not be publicly accessible there are not likely to be interactions between workers and

Key Mitigations Identified by EAO	Predicted Residual Effects
	land users (e.g. Aboriginal peoples). TKN feels that the quality of experience of using areas outside of the Restricted Area could be affected due to potential increases in the use of the region for hunting, fishing and recreational purposes, caused by increased traffic along the ORAR (due to upgrades and maintenance of the road). Although employees are not likely to cause a reduction in the quality of experience outside of the restricted access area, EAO predicts that there could be a low magnitude residual effect to human presence of non-employees in the region due to improved access along the ORAR.

Table 41: CULRTP Effect Pathway 3 - Change to the Availability of Resources

Potentially Impacted Aboriginal Peoples:

TKN, WMFN, MNBC, Gitxsan wilp Nii Kyap

Key Mitigations Identified by EAO	Predicted Residual Effects
<u>Fish – Key Mitigations:</u> • Implementing a "no fishing" policy for all project staff and contractors at the KUG Project area; • Fish and Aquatic Effects monitoring plan to monitor bioaccumulative contaminants in fish in Thutade Lake; • Conducting instream works during the designated FLNRO regional timing window (or fisheries work window) with a QP present; • Implementing water flow management to reduce effects of changes in water quantity, and reduce run-off, sedimentation and effects on water quality (see Table 30); • Implementing water management to reduce effects on water quality (see Table 30);	<u>Fish – Predicted Residual Effects:</u> The Application predicts residual effects to fish and aquatic habitat from the KUG Project (changes in water quantity and quality in Waste Rock Creek and Attichika Creek). Please see section 3.4 of this report for a summary of these predicted residual effects and their significance characterization. MNBC expressed concern that the KUG Project could result in increased environmental concentrations of COPCs in fish but that the proposed provincial and federal tissue monitoring conditions should be adequate to address this issue. TKN indicated that potential impacts to fish and fish habitat from the KUG Project

Key Mitigations Identified by EAO	Predicted Residual Effects
• Planting vegetation to reduce soil exposure and surface erosion (see Table 30); and • Monitoring and adaptive management to address effects of the KUG Project on fish and aquatic habitat (see Table 30).	would be incremental (i.e. cumulative) to those from KS and would contribute to the perception of risk, which could deter members of the TKN First Nations from fishing. Furthermore, TKN stated that any impacts from the KUG Project would be cumulative to other historical environmental impacts in the TKN traditional territories. Considering the mitigation measures, including a Fish and Aquatic Effects monitoring plan, proposed by TKN to ensure no incremental effects from the KUG Project on bull trout in Thutade Lake, EAO does not predict that these effects would adversely affect Aboriginal peoples' fishing activities in the LSA as effects to fish would be local in extent and not significant.
<u>Wildlife – Key Mitigations</u> • Creating gravel ramps over the water discharge line in order to facilitate movement over them for medium and large mammals (the details of how many ramps and where they will be installed would be determined during the development of the Wildlife Management and Monitoring Plan in consultation with TKN and regulatory agencies); • Managing snowbank height on project roads and creating escape pathways (i.e., gaps, the specific number and location of which is yet to be determined) in snowbanks to allow wildlife (e.g., moose) to exit the road area; • Creating and maintaining road culverts to facilitate movement/habitat connectivity for small furbearers; • Applying speed limit restrictions on traffic along all KUG Project roads that bisect potential movement corridors	<u>Wildlife – Predicted Residual Effects:</u> The Application predicts a variety of residual effects to wildlife from the KUG Project (disruption of movement, habitat loss and alteration, impacts from attractants, sensory disturbance, and direct and indirect mortality) to a variety of species. EAO characterized residual effects to wildlife (excluding caribou) from the KUG Project as not significant: EAO considered the low to moderate magnitude of residual effects, the potential long term or far future duration of some of these effects, and their reversible nature (except for impacts to hoary marmot due to subsidence, which could cause irreversible destruction of hoary marmot dens and direct mortality to the species). With AuRico's proposed mitigations, as well as proposed EAC conditions including mitigation and monitoring measures identified in the Wildlife Management and Monitoring Plan EAO concludes that residual adverse effects to wildlife VCs

Key Mitigations Identified by EAO	Predicted Residual Effects
(e.g., wildlife movement corridors that run east-west through the LSA and along Attichicka Creek); • Educating employees to assess and adaptively manage driving activities during crepuscular hours (i.e., dawn and dusk), which are periods of high wildlife activity; • Flying staff to the mine site, and encouraging trucks to travel in convoys on the ORAR, where possible, to limit traffic disturbance over the course of a day; • Undertaking reclamation activities designed to remove barriers and accommodate wildlife movement following mine closure; • Undertaking pre-construction surveys for active hoary marmot dens within subsidence zone and 250 m buffer area; • Access management to the KUG Project area (i.e. limiting access to only KUG Project personnel through a staffed security gate off the ORAR; • Prohibition of hunting and trapping by employees; • Removing carrion from KUG Project roads; and • Mitigation measures for migratory birds (see table 30 above) and SARA-listed species (see table 42 below).	(excluding caribou) would be not significant. Please see section 3.5 of this report for further details of these predicted residual effects and their significance characterizations. These predicted effects could change Aboriginal harvesting patterns in the LSA due to species availability. MNBC noted that while wildlife resources are not likely to be significantly impacted by the KUG Project, it could result in increased environmental concentrations of COPCs, which may accumulate through soils and water to wildlife. MNBC was of the view that this issue was inadequately addressed in the EA. MNBC stated that monitoring and assessing of COPCs may need to be added to the provincial and federal conditions. EAO did not predict a residual adverse effect to wildlife from COPCs from the KUG Project. However, EAO recommends a follow-up program including monitoring to verify AuRico's predictions in the EA and track any potential increases in COPC concentrations in the environment and inform additional mitigation. TKN noted that past impacts to caribou in the area have already changed their harvesting patterns for this species as they no longer hunt caribou in the general KS and KUG Project areas. TKN noted that as they would be excluded from the KUG Project and KS footprint and buffer areas, this would reduce the area in which they could harvest resources in their territories. Additionally they have indicated that due to other past and current natural resource based activities in the broader region (e.g. forestry, the Williston dam) their ability to harvest resources in their territories has decreased.

Key Mitigations Identified by EAO	Predicted Residual Effects
	EAO characterized the effects of the KUG Project on caribou as not significant: EAO considered the low to moderate magnitude of residual effects, the potential long term or far future duration of some of these effects, and their reversible nature. With AuRico's proposed mitigations, as well as proposed EAC conditions including mitigation and monitoring measures identified in both the Caribou and Wildlife Management and Monitoring Plans, the CHPA process underway and existing provincial mitigations (such as ungulate winter ranges) EAO concludes that residual adverse effects to caribou would be not significant. EAO also notes that TKN will be involved in the ongoing monitoring of caribou and discussions of adaptive management related to caribou through the development and implementation of the Wildlife Management and Monitoring Plan and through the proposed Environmental Monitoring Committee. With continuing involvement, TKN will have influence to help ensure that the KUG Project does not adversely affect the long term reestablishment of the caribou population.
<u>Harvestable Plants – Key Mitigations</u> • Implementation of dust and erosion control measures; • Implementation of water control features to maintain natural hydrologic regimes; • Detection and control of invasive plants; and • Restoration of ecological functioning during closure through re-vegetation and ecosystem-based monitoring.	<u>Harvestable Plants - Predicted Residual Effects:</u> The Application states that subsidence and other KUG Project activities could result in the loss of 39.6 ha of harvestable plant habitat and alteration of up to 170.8 ha of potential harvestable plant habitat. The majority of effects attributed to alteration were caused by dust with contributing effects due to erosion, invasive plant species, and changes to hydrology. Residual effects are predicted for harvestable plants due to surface clearing and creation of edges which cannot be fully mitigated.

Key Mitigations Identified by EAO	Predicted Residual Effects
	TKN noted that as they would be excluded from the KUG Project and KS footprint and buffer areas, this would reduce the area in which they could harvest resources in their territories. Additionally they have indicated that due to other past and current natural resource based activities in the broader region (e.g. forestry, the Williston dam) their ability to harvest resources in their territories has decreased. EAO predicts the effects to harvestable plants would be reversible, low magnitude, and of localized extent. Therefore, EAO does not predict significant adverse effects on harvestable plants from the KUG Project and notes that residual effects to harvestable plants would all be within the restricted access area.

Cumulative Effects Assessment - Current Use of Lands and Resources for Traditional Purposes

TKN stated that their ability to harvest fish (Dolly Varden and bull trout), caribou, moose, mountain goat, stone's sheep, and grizzly bear in their territories is already moderately to highly constrained. They attribute this reduced ability to harvest these resources to past resource activities in their territories, such as KS and forestry, and point to the conservation status and population trends of some species as evidence of their constrained baseline. TKN think that the KUG Project would have incremental negative impacts on their ability to harvest these resources that range in severity by species (according to TKN: serious for fish and caribou; moderate for moose; and negligible or minor for other species). TKN attribute these cumulative impacts to the following factors:

- the loss of area available for TKN use due to the Restricted Area;
- TKN's concerns about potential water quality and quantity impacts from the KUG Project;
- reduction in traditional use activities due to the perception of contamination of fish and wildlife;
- Increased human presence and competition for resources (e.g. more anglers and hunters) due to maintenance of the ORAR and winter clearing;
- The constrained baseline of the ability to harvest many species due to past natural resource activities in their traditional territories and climate change.

Overall Conclusions

Caribou

TKN view that any impacts to their ability to hunt caribou would be serious, primarily due to the current status of caribou herds (Chase and proposed Thutade herds) in their traditional territories. As a result of the state of caribou, TKN does not currently hunt caribou, but has indicated that they would if the species were to recover. TKN has recommended a caribou monitoring and management plan as an EAC condition. EAO has proposed this plan as an EAC condition to be developed in consultation with TKN.

In order to consider the impact of the KUG Project on CULRTP, consideration is given to whether the KUG Project would impact the future ability of TKN to resume caribou hunting. That is, will the KUG Project materially delay or prevent the reestablishment of populations that can be sustainably harvested by Aboriginal groups. In considering this question, EAO notes the following:

- EAO characterized the effects of the KUG Project on caribou as not significant: EAO considered the low to moderate magnitude of residual effects, the potential long term or far future duration of some of these effects, and their reversible nature. With AuRico's proposed mitigations, as well as proposed EAC conditions including mitigation and monitoring measures identified in both the Caribou and Wildlife Management and Monitoring Plans, the CHPA process underway and existing provincial mitigations (such as ungulate winter ranges). EAO concludes that residual adverse effects to caribou would be not significant.
- Mitigation measures required by the Wildlife Management and Monitoring Plan condition specifically address the key disturbances related to the KUG Project. The Wildlife Management and Monitoring Plan includes adaptive management to allow mitigation measures to change based on new information and monitoring results. EAO expects these will be effective in reducing the potential impact of the KUG Project on caribou.
- TKN will be involved in the ongoing monitoring of caribou and discussions of adaptive management related to caribou through the development and implementation of the Wildlife Management and Monitoring Plan and through the proposed Environmental Monitoring Committee. With continuing involvement, TKN will have influence to help ensure that the KUG Project does not adversely affect the long term reestablishment of the caribou population.
- The KUG Project does not destroy CH. The only CH potentially affected is related to use of existing infrastructure (ORAR). The land disturbance associated with the KUG Project is not in an area with established CH under SARA.

- The reestablishment of the caribou population will depend on larger measures and resource development decisions beyond the KUG Project, such as the following:
    - There are current and anticipated future provincial measures to address the broader management and habitat protection measures, including:
        - Already established ungulate winter ranges in the Chase herd area near the ORAR;
        - Further studies planned that will inform both provincial initiatives as well as adaptive management for the Wildlife Management and Monitoring Plan, as well as coordination of initiative by FLNRO contemplated to address the multiple ORAR users and related effects.
        - The CHPA study that is expected to result in better information on what is needed to protect Southern Mountain caribou and additional measures may be implemented.

EAO also notes that currently permitted caribou harvesting in the threatened Chase herd is within the sustainable harvest criteria used by the Province, and is therefore not anticipated be detrimental to the recovery of the Chase herd.

EAO concludes that in light of these considerations, there is no reason to believe that the KUG Project in and of itself will make a material difference to the long term recovery of the caribou populations, and therefore will not have a significant adverse residual or cumulative effect on CULRTP with respect to hunting caribou.

Fish

TKN think that any impacts from the KUG Project would cause a serious effect on their ability to fish (particularly for Dolly Varden and bull trout), as they state that their current ability is already highly constrained due to past natural resource activities in their territories (including KS).

EAO characterized the residual effects to fish and aquatic habitat through changes to surface water quality and quantity as not significant (see Table 41 above and section 3.4.3.1 of this report for details on mitigations and relevant EAC conditions). EAO predicts that there would be residual effects to access, to the quality of the fishing experience due to potentially increased human presence, and to perceptions of contamination in the LSA (which could impact harvesting practices). However, EAO notes that the KUG Project would be over 400 km from Mackenzie along the ORAR, so would not likely attract many anglers. Additionally, the KUG Project would result in winter clearing of the northern 168 km of the ORAR (the portions from Mackenzie until the northern 168 km are already being maintained year round). The combination of a long total distance from Mackenzie and the fact that the KUG Project would only open

up the farthest portion of the road during the winter leads EAO to predict that the KUG Project would not likely cause a significant increase in anglers to the KUG Project area. Finally, considering the potential increased perception of contamination, EAO is proposing the following EAC conditions:

- Water Management requiring AuRico to treat the effluent from the KUG Project TSF for metals and Se to meet WQG or SBEB;
- Fish and Aquatic Effects Monitoring Plan requiring monitoring of concentrations of bioaccumulative contaminants in bull trout in Thutade Lake;
- Amazay Lake Monitoring Plan requiring monitoring of water quality of Amazay Lake and groundwater to detect groundwater movement from the underground cave/subsidence zone towards Amazay Laketo ensure there are no adverse effects on Amazay Lake;
- Ensure that there are no incremental effects from the KUG Project on Se in Waste Rock Creek from the KUG Project TSF;
- Aboriginal monitors conduct environmental monitoring and report back to TKN communities; and
- Environmental Monitoring Committee to provide a forum for information sharing, and discussion of topics of interest to TKN to ensure that all parties are involved in the ongoing development of the mine, mitigation and monitoring measures and adaptive management.

In consideration of the non-significant impacts to fish and aquatic habitat, the likely low magnitude of effects of increased human presence (due to the distance from Mackenzie) and the proposed EAC conditions to mitigate impacts to the perception of contamination, EAO concludes that the KUG Project would not have significant residual or cumulative effects on CULRTP with respect to fishing.

Harvestable Plants and Other Wildlife

TKN view that impacts from the KUG Project would cause a range of severity of effects on their ability to harvest particular wildlife species: moose (moderate effects), mountain goat and stone's sheep (minor effects), grizzly bear and hoary marmot (negligible to minor effects). This is based on TKN's assessment that their current ability to harvest these species, aside from hoary marmot, is moderately constrained due to past natural resource activities in their territories, including KS. See Part C of this report for additional details on TKN's views and characterizations of impacts on wildlife species.

EAO characterized residual effects to wildlife from the KUG Project as not significant: EAO considered the low to moderate magnitude of residual effects, the potential long term or far future duration of some of these effects, and their reversible nature (except

for impacts to hoary marmot due to subsidence). With AuRico's proposed mitigations, as well as proposed EAC conditions including mitigation and monitoring measures identified in the Wildlife Management and Monitoring Plan EAO concludes that residual adverse effects to wildlife VCs would be not significant.

EAO is proposing an EAC condition for a Wildlife Management and Monitoring Plan that would include a variety of mitigation measures. Concerning moose, mountain goat and hoary marmot (species which were assessed as wildlife VCs in this EA, and which TKN have noted have particular importance for them), EAO is proposing the following mitigation measures in the plan:

- Mitigation for noise associated with blasting for wildlife receptors ;
- Maintaining buffers from sensitive wildlife areas must be informed by approved Ungulate Winter Range General Wildlife Measures;
- An Alpine Species Mitigation and Monitoring Plan (which was suggested by TKN), which would include:
    - Mitigation and management measures to reduce effects of habitat loss/alteration and sensory disturbance from project infrastructure and activities in alpine and sub-alpine habitat;
    - Identification of important habitat areas for Hoary Marmot and other alpine species prior to commencement of construction activities; and
    - Monitoring of the effectiveness of mitigation and management measures and habitat changes on Hoary Marmot and other alpine species and adaptive management of KUG Project construction activities based on monitoring results.
- An ORAR Environmental Monitoring and Management Plan (for the northern 168 km of the ORAR), which would include:
    - Mitigation measures to reduce attractants of roadside vegetation to moose (suggested by TKN);
    - Mitigation to manage snowbank heights to provide escape pathways (i.e., gaps) to allow wildlife to exit the plowed roads; and
    - Monitoring of road dust on wildlife habitat (suggested by TKN).

EAO characterized residual effects to harvestable plants from the KUG Project as not significant: EAO predicts the loss of 39.6 ha and the alteration of 170.6 ha of harvestable plant habitat from subsidence, dust and hydrological changes associated with the KUG Project. EAO predicts these effects to harvestable plants would be of neutral context, reversible, low magnitude, of localized extent and would not interfere with the ability to meet relevant Land Resource Management Plan objectives[30].

[30] Land Resource Management Plans have been developed by the BC government to address land use conflicts, environmental issues and competition amongst resource user groups. They have been used as

Therefore, EAO does not predict significant adverse effects on harvestable plants from the KUG Project and notes that residual effects to harvestable plants would all be within the restricted access area.

As noted above, EAO predicts that there would be residual effects to access, to the quality of the harvesting and gathering experiences due to potentially increased human presence, and to perceptions of contamination (which could impact harvesting practices). However, as described above, EAO notes that the KUG Project would be over 400 km from Mackenzie along the ORAR, so would not likely attract many hunters and recreationalists to the RSA. Additionally, considering the potential increased perception of contamination, EAO is proposing the above noted EAC conditions (see fish section for CULRTP).

In consideration of the non-significant impacts to harvestable plants and wildlife, the likely low magnitude of effects of increased human presence (due to the distance from Mackenzie) and the proposed EAC conditions to mitigate impacts to the perception of contamination, EAO concludes that the KUG Project would not have significant residual or cumulative effects on CULRTP with respect to hunting, trapping or gathering.

10.4 CEAA 2012 5(2) Requirements

CEAA 2012 5(2)(a) requires an assessment of changes to the environment that are directly linked or necessarily incidental to the exercise of a power or performance of duty or function by a federal authority. Paragraph 5(2)(b) requires an assessment of changes to any associated effects on health, socio-economic conditions, matters of historical, archaeological, paleontological or architectural interest, or other matters of physical or cultural heritage not already considered in under paragraph 5(1)(c).

AuRico currently holds explosive magazine licences for both mining (quarrying) and avalanche control for KS. The following federal authorizations are anticipated to be potentially required from NRCan for operations of the KUG Project:

- User Magazine Licence (Section 145 Explosives Regulations, 2013); 7(1)(a) *Explosives Act* (1985a); and
- Division 1 Factory Licence (Section 60 Explosives Regulations, 2013); 7(1)(a) *Explosives Act* (1985a).

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a primary process for obtaining public sanction for new parks and protected areas. They are typically multi-agency initiatives coordinated by a designated planning agency, and involve stakeholders in an “interests-based negotiation” at a planning table. LRMP approval has been a Cabinet decision. Within the Makenzie LRMP, the relevant objective for the broader Thutade zone containing the KUG Project is: Maintain the opportunity for the sustainable use of botanical forest products such as wild berries, mushrooms and medicinal plants.

The KUG Project would re-establish the explosive storage facility used during KS located along the existing road between the process plant area and KS TSF to support blasting associated with access tunnel development, underground decline development, and underground mining. The explosive storage facility would be operated by an independent contractor under their business license and operating permits. AuRico notes that this facility would be located on previously disturbed lands in an area that was in regular use during KS operations (and which continues to experience have some human activity), which would avoid impacts to terrain and soils, terrestrial ecology wildlife (including SARA listed species), and heritage resources (see "20161117_B.1_KUG Comment CEAA-016_Section 5(2)_Memo"). Additionally, as there would be no effluent from the facility and hazardous materials would be stored and managed in accordance with the Environmental Emergency, Spill, and Hazardous Materials Plan (see s. 24.6 of the Application), AuRico does not predict any effects to surface or groundwater quantity or quality, or the fish and aquatic habitat VCs. Lastly, as AuRico does not anticipate any residual effects to any of the above noted environmental VCs, they also do not predict any impacts to human health or socio-economic conditions from these federal authorizations. Environmental effects not already described in the sections above, resulting in a change to health and socio-economic conditions, physical and cultural heritage and any structure, site or thing that is of historical paleontological or architectural heritage directly linked or necessarily incidental to the exercise of a power or performance of duty or function by a federal authority would not be anticipated as a result of the KUG Project.

The Application notes that AuRico would award an explosives contract to a major explosives supplier to construct and operate an explosives manufacturing and storage facility at the KUG Project area. It would be the contractor's responsibility to obtain the needed approvals for the facility. Bulk explosives would be manufactured by the explosives supplier and be delivered to the blast-hole by a properly labelled delivery vehicle (mobile process unit) that must be kept clean and properly maintained.

NRCan has informed EAO that the federal licences for explosive manufacturing and storage will include terms and conditions for the safe and secure operation of the facility which must be constructed and operate according to requirements set out in the Guidelines for Bulk Explosives Facilities (2014). The Quantity-Distance Standard, which is applied to licences for explosives manufacturing and storage under the Explosives Act, requires that minimum distances be maintained between certain components of the facility, and between the facility and neighbouring vulnerable features or hazardous facilities such as roads, fuel storage, administration and accommodation facilities and power lines.

10.5 *Species at Risk Act* 79(2) Requirements

SARA 79(2) requires the identification of adverse effects of the KUG Project on the SARA listed wildlife species and its CH and, if the KUG Project is carried out, must ensure that measures are taken to avoid or lessen those effects and to monitor them.

The assessments required for SARA 79(2) are summarized in Table 42.

Table 42: Summary of Effects Related to SARA 79(2)

Key Mitigation Identified by EAO	Effects Assessment (Predicted Residual Effects)	EAO's Significance Conclusion (see Table 30 for residual effects ratings)
Woodland Caribou (proposed Thutade herd (mine site): special concern; Chase herd (ORAR): threatened)		
A caribou management and monitoring plan that includes the following components / criteria: • The plan must be informed by: o the data in Herd Boundary Refinement for the Chase, Spatsizi, and Frog Caribou Herds in North-central BC, Sittler, K.S., et al., 2015; and o mitigation measures used by other industries and in other geographic areas, for caribou, their effectiveness, and how they might be applicable; • Mitigations to restrictions on for caribou movement in the area of subsidence; • Measures to monitor caribou movement in areas impacted by the Project; • Identify opportunities to support caribou habitat through reclamation; • Road decommissioning and restoration to close off access and reduce opportunities for movement of	Predicted residual effects to caribou: • Habitat loss and alteration (3.5% of high quality habitat combined for all in the LSA and 0.007% of RSA) • Disruption of movement from access corridor and discharge line • Sensory disturbance (3.6% of high quality habitat in the LSA and 0.02% in the RSA) • Indirect mortality from increased	Context – L Magnitude – L-M Extent – D-R Duration – MT-FF Reversibility – R Frequency – OT, S Likelihood – M Significance – Not significant

Key Mitigation Identified by EAO	Effects Assessment (Predicted Residual Effects)	EAO's Significance Conclusion (see Table 30 for residual effects ratings)
caribou predators; • Participation in mitigation and monitoring initiatives that may be developed by provincial or federal agencies to understand and mitigate risks to caribou and its habitat in the caribou RSA; • Monitoring of the effectiveness of mitigation including monitoring of wildlife ramps over the water discharge line and other movement corridors with cameras; • Caribou mitigation measures listed in Table 15.6-23 of the Application; • Mitigation for noise associated with blasting for wildlife; • Mitigation measures that are part of the ORAR Environmental Monitoring and Management Plan including attending meetings and participating in initiatives to inform environmental management and monitoring along the ORAR, including in relation to transportation related wildlife effects along the ORAR and implement measures identified by such initiatives as applicable. • A condition requiring AuRico to enter into an agreement with FLNRO that would set out the terms of AuRico's participation in a program of activities that supports the conservation and management of caribou in the KUG Project area. The agreement may require AuRico to contribute up to $30,000 toward the cost of implementing the program.	predation due to winter clearing of the ORAR	
Western Toad (special concern)		
Key mitigation measures for western toad:	Predicted residual effects to western	Context – M Magnitude – L

Key Mitigation Identified by EAO	Effects Assessment (Predicted Residual Effects)	EAO's Significance Conclusion (see Table 30 for residual effects ratings)
• Adherence to mitigation measures for working in riparian areas (including hand felling of trees, siltation control, and avoiding alteration of wetland conditions by limiting machinery use in these areas); • Maintain a 30 m riparian buffer, and larger where possible, around waterbodies; • Avoidance of vegetation clearing near ponds from May to August; or pre-clearing surveys of ponds for evidence of western toad breeding if vegetation clearing occurs near ponds from May to August (implement no-disturbance buffers surrounding any identified breeding habitats for western toads found during pre-construction surveys using guidance provided in ECCC (2016); • Construct drainage ditches that promote free drainage and avoid standing water; • Surveys prior to construction of the water discharge line through the potential suitable western toad habitat near Attichika Creek to determine if breeding is occurring in this wetland. If it is confirmed, construction will occur when the toads are no longer in the area or alternate mitigation measures would be employed to avoid effects on breeding toad. Observations of western toads will also be a part of the wildlife monitoring program; and • Implement no-disturbance buffers surrounding any identified breeding	toad: • Disruption to movement from the water discharge line • Habitat loss and alteration (4.2% of high quality habitat in LSA and 0.048% of LSA)	Extent - Lo Duration – LT (disruption to movement) & FF (habitat loss and alteration) Reversibility – R Frequency – OT (habitat loss and alteration) & S (disruption to movement) Likelihood – M Significance – Not significant

Key Mitigation Identified by EAO	Effects Assessment (Predicted Residual Effects)	EAO's Significance Conclusion (see Table 30 for residual effects ratings)
habitats for western toads found during pre-construction surveys using guidance provided in 2016 Environmental Assessment Standard Guidance for the Western Toad, ECCC 2016). Buffers will include the maximum distance recommended in ECCC (2016) to ensure protection of habitat that encompasses a large amount of western toad movement in terrestrial habitats surrounding aquatic breeding areas.		
Migratory birds: **Rusty Blackbird** (RB; special concern); **Common Nighthawk** (CN; threatened); **Olive-sided flycatcher** (OSF; threatened)		
Key mitigation measures for migratory birds: • The key mitigation measures related to reducing impacts to habitat loss and alteration for migratory birds would be contained in the wildlife management and monitoring plan, which would include the following: • Pre-clearing surveys of migratory birds by a QP; • A scientifically sound approach for monitoring that includes: o A list of existing standards to be followed during the Project, including RISC standards for inventory and survey methods of Forest and Grassland Birds (including recommendations for survey frequency and timing), as well as other species-specific survey and inventory methods accepted by ECCC where applicable for species that are often not detected using RISC standards;	Predicted residual effects to migratory landbirds • Habitat loss and alteration (2.9% of high quality habitat in the LSA and 0.026% in the RSA) Predicted residual effects to OSF • Habitat loss and alteration (potential impacts to 7.6% of habitat in LSA and 0.087% in RSA) • Sensory disturbance (potential disturbance of up to 7.8% of habitat in LSA;	Context – M Magnitude – L (RB,CN) & M (OSF) Extent – D (habitat loss) & Lo (sensory disturbance) Duration – MT (sensory disturbance) & FF (habitat loss) Reversibility – R Frequency – OT (habitat loss) & C (sensory disturbance) Likelihood – M Significance – Not significant

Key Mitigation Identified by EAO	Effects Assessment (Predicted Residual Effects)	EAO's Significance Conclusion (see Table 30 for residual effects ratings)
o descriptions of how surveys will be carried out by a QP in a manner that protects and avoids harming, killing or disturbing migratory birds or destroying or taking their nests or eggs, following advice from ECCC's Avoidance Guidelines (http://www.ec.gc.ca/paom-itmb/); • Protection of active nest sites by species specific buffers using guidance from General Nesting Periods of Migratory Birds in Canada, ECCC 2016, with a minimum 30 m buffer if evidence of nesting behaviour is observed and avoiding clearing outside of the reduced risk window as identified in the Region 7 Omineca – Reduced Risk Windows for Fish and Wildlife (Ministry of Water, Land and Air Protection 2004) is not possible; • Requirement to record the exact buffer distance employed for any nest sites and report the outcome of the nesting attempt in annual reporting; • implement deterrent measures to minimize bird access to select effluent ponds and KUG Project TSF until WQG for wildlife are met; • monitor infrastructure for evidence of nesting and adaptive management as necessary based on species; • monitor / record on-site wildlife observations, sightings, incidences and interaction with KUG Project infrastructure; • adaptive management to address	and up to 0.089% in RSA)	

Key Mitigation Identified by EAO	Effects Assessment (Predicted Residual Effects)	EAO's Significance Conclusion (see Table 30 for residual effects ratings)
effects of the KUG Project if those effects: o are not mitigated to the extent contemplated in the Application; or o are not predicted in the Application; and • noise dampening on equipment (mitigation for sensory disturbance).		
Little Brown Myotis (endangered)		
Key mitigation measures: • Mitigations consistent with the recommended mitigation, management and monitoring practices identified in the Best Management Practices for Bats in BC (ENV 2016); • Pre-clearing surveys of bats by a QP to determine the distribution of bat roosting habitat relative to Project infrastructure and activities • Offsets for the potential loss of observed bat roosting habitat by installation of bat boxes or artificial roost trees as per ENV 2016, in suitable locations as determined by a QP; • Installation of alternate lighting in order to reduce attractants to bats from Project infrastructure if a QP determines lighting is an attractant to bats based on bat observations near infrastructure; and • Monitor and report incidental observations of bats using infrastructure areas;	Predicted residual effects to bats: • Habitat loss and alteration (4.6% of high quality habitat in the LSA and 0.053% in the RSA)	Context – M Magnitude – L Extent – D Duration – FF Reversibility – R Frequency – OT (habitat loss) Likelihood – M Significance – Not significant

Key Mitigation Identified by EAO	Effects Assessment (Predicted Residual Effects)	EAO's Significance Conclusion (see Table 30 for residual effects ratings)
Short-eared owl (special concern)		
Key mitigation measures from the Application for all raptors are applicable to short-eared owl: • Avoid clearing trees during March to August; or pre-clearing surveys for nests if clearing occurs from March to August in order to identify and avoid nests; • Remove carrion from project roads; • Construct transmission line using best management guidelines of the Avian Power Line Interaction Committee (2012); and • Monitor transmission line for nesting activity and manage adaptively. Additional mitigations identified during Application review include: • Pre-clearing surveys will occur for short-eared owl in alpine tundra and areas identified as suitable habitat in the Application starting March 1 to September 15 (i.e., earlier than for migratory birds); and • If short-eared owl nests or evidence of nesting is observed then appropriate buffers will be used in order to minimize disturbance and avoid loss of the nest.	Predicted residual effects: • Habitat loss and alteration (2.5% of high quality habitat in the LSA and 0.029% in the RSA)	Context – M Magnitude – L Extent – D Duration – FF Reversibility – R Frequency – OT (habitat loss) Likelihood – M Significance – Not significant

EAO does not predict any significant residual or cumulative effects to any of the above SARA listed species.

10.6 Follow-up Programs

Under CEAA 2012, follow-up programs are required to verify the accuracy of the EA predictions and/or determine the effectiveness of any mitigation measures. Follow-up

programs would be focused on potential effects to VCs considered under section 5 of CEAA (e.g., fish and fish habitat, migratory birds, effects to Aboriginal peoples and other VCs as described in this section of this report).

The following EAO recommendations are considered potential areas for follow-up programs under CEAA 2012:

- Requirements for a surface water quality monitoring plan for Amazay Lake and a groundwater monitoring plan to detect potential groundwater movement from the underground workings towards Amazay Lake to ensure no adverse effects to the culturally important Amazay Lake or effects on Aboriginal Interests, as predicted by the EA;
- Fish and aquatic effects monitoring and analysis of bioacummulative substances in bull trout in Thutade Lake to verify the predictions of the EA and provide TKN with information on contaminant levels in fish and ensure the protection of Aboriginal Interests;
- Monitoring of Attichika Creek in the area downstream of the discharge pipeline to determine if bull trout or rainbow trout are avoiding the IDZ;
- Monitoring for migratory birds and SARA-listed bird species to determine bird presence, behaviour and nesting;
- A plan to monitor and record caribou observations and mortalities as a result of the KUG Project to assess the accuracy of EA predictions; and
- A plan to monitor potential increases in COPCs in environmental media and country foods, if increased levels of COPCs are observed in environmental media, as a result of the KUG Project, to address impacts on the health of Aboriginal peoples consuming country foods.

PART C – FIRST NATIONS CONSULTATION

11. Collaboration and Engagement with Tse Keh Nay First Nations

11.1 Project Overview

AuRico is proposing to develop the KUG Project, located approximately 250 km north of Smithers in a mountainous area of north-central BC. The KUG Project is an underground copper-gold mine which is designed to process approximately 24,640 tpd of ore over a 13-year mine life. During the life of mine operations, the KUG Project would produce an anticipated 1.3 M ounces of gold and 563 M pounds of Cu.

The KUG Project would be developed at the site of the former KS that is now in care and maintenance. The KUG Project would use existing infrastructure at KS (currently under care and maintenance), including the process plant, open pit (which would be used for the tailings and waste rock storage facility for the KUG Project), and administrative/service complex and accommodation. Minor upgrades to KS infrastructure would be required for the KUG Project. The KUG Project would use the existing airstrip and road access to the site. Power would be provided by the existing 380 km, 230 kV transmission line.

As the KUG Project is a modification of KS, which has an EAC, AuRico would have required an amendment to its EAC to build the KUG Project. However, AuRico requested the KUG Project be designated as a reviewable project pursuant to Section 7(3) of the Act to ensure the KUG Project would be subject to a full EA. An Order was issued by the Executive Director of EAO on February 7, 2014 designating the KUG Project as a reviewable project. A Project Description was submitted to EAO on February 12, 2014 and an Order under Section 10(1)(c) of the Act was issued on February 18, 2014, which requires AuRico to obtain an EAC before the KUG Project can proceed.

The KUG Project is a designated project pursuant to Section 16(c) of the Regulations Designating Physical Activities (SOR/2012-147) under CEAA 2012 as the production rate would exceed the threshold for a gold mine of 600 tpd. The Agency commenced an EA and granted substitution of the federal EA to BC on April 8, 2014.

The substituted EA of the KUG Project is being undertaken pursuant to the MOU. EAO is conducting the procedural aspects of Aboriginal consultation, and providing provincial funding and distributing federal funding to Aboriginal groups to facilitate their participation in the EA process.

11.2 Description of Government-to-Government Collaboration between TKN and EAO

11.2.1 Overview

A Section 11 Order for the KUG Project was issued by EAO on May 14, 2014, which outlines the scope, procedures and methods for the EA, including government agency, public and Aboriginal consultation requirements. Schedules B and C of the Order define the Aboriginal Groups who must be consulted during the EA process. The Section 11 Order Schedule B included TLFN and TKD, and Schedule C included KwN. On June 23, 2014, following consultation with the affected First Nations, EAO issued an Order under Section 13 of the Act, which amended the Section 11 Order by moving KwN to Schedule B.

TKD, TLFN, and KwN are jointly represented by the TKN alliance. Through this alliance, the TKN work together when engaging with government and industry on projects or matters of shared interest. Each First Nation within TKN is represented by their respective Chief and decisions of TKN are made by consensus. The alliance formed by the TKN First Nations is based on their common history, culture and language, and deep social and political ties.

In order to recognize the collaborative approach between EAO and TKN (discussed further in section 11.4 below), EAO further amended the section 11 Order to include collaborative activities with TKN in a section 13 Order issued December 21, 2016. This section of Part C pertaining to TKN was written collaboratively by TKN and EAO, as agreed to in the KUG Collaboration Plan. It describes the consultation and collaboration that occurred during the EA for the KUG Project between TKN and EAO, and provides a consensus-based assessment of the adequacy of consultation and accommodation of the potential KUG Project impacts to the Aboriginal title, rights, and interests of the TKN First Nations.

11.3 EAO Consultation – Pre-Collaboration

EAO consulted TKN as described in the Section 11 Order. EAO invited each of the TKN First Nations to review and comment on the Section 11 Order, draft AIR and AuRico's

draft Aboriginal Consultation Plans and Reports.

Throughout the pre-application phase of the EA, TKN participated in Working Group meetings and meetings with EAO, and commented on the draft documents.
EAO provided provincial and federal capacity funding to each of the TKN First Nations for pre-Application and Application review, as well as additional funding to develop and fulfil collaborative commitments.

11.4 EAO-TKN Collaboration

On April 2, 2015, the Province of BC and the CSFN entered into a CA. TLFN is a signatory to the agreement, which provides a framework for BC and the CFSNs to engage in collaborative decision-making for major projects. The CA between BC and the CSFN commits the parties to seek (i) to develop consensus recommendations in relation to the design and implementation of EAs and regulatory review processes in relation to major approvals, and (ii) consensus in relation to decisions on major approvals.

TKN and EAO recognized the established relationships and agreements among TLFN, KwN and TKD, as well as between TKN and AuRico that are unique to the KUG Project and which presented collaboration opportunities. TKN and EAO recognize the importance of TLFN maintaining its relationships and commitments related to TKN and with AuRico. EAO therefore agreed to extend and apply the commitments in the CA to TKN as a collective for the purpose of the EA of the KUG Project.

EAO and TKN worked together to create a collaboration plan (KUG Collaboration Plan) to facilitate collaboration on the EA within the spirit and intent of the CA, including addressing the potential adverse effects of the KUG Project on the Aboriginal title, rights, and interests of the TKN First Nations.

EAO and TKN worked together through the Application evaluation phase to ensure that concerns raised by TKN were addressed prior to the Application being accepted by EAO for detailed review. Throughout the Application review period, EAO and TKN met regularly to discuss the Application review schedule and specific KUG Project-related issues, the content of Part C, and proposed conditions.

EAO and AuRico attended community meetings in Kwadacha on June 6 and 7, 2016, which were attended by 13 elders (June 6) and 47 community members (June 7); and in Takla Landing on June 30, 2016, which was attended by 28 community members. The purpose of the community meetings was to: (i) build understanding of the KUG Project, the EA process and how First Nations' interests and concerns are incorporated into the process and addressed; (ii) share the main themes of issues and concerns heard to

date regarding the KUG Project; (iii) communicate how AuRico has considered concerns from these First Nations in the design of the KUG Project; and (iv) provide an opportunity for the First Nations to share additional information with AuRico and EAO.

At Kwadacha, comments from community members were focused on the following themes: the impact of the KUG Project on water quality including drinking water and potential effects on fish; questions and concerns about the tailings pond including long term responsibilities and liabilities in the event of a catastrophic failure; impacts to wildlife; effects on food and medicinal plants; and employment and training opportunities.

At Takla Landing, comments from community members were focused on the following themes: consultation (with Chief and Council and K'eyukh holders) and communication with TLFN community members; concerns around catastrophic failure of the KUG Project TSF; potential effects of the KUG Project on water quality and wildlife; questions about responsibility and liability for reclamation; concerns about impacts to Aboriginal rights and health; and training and employment opportunities for TLFN.

EAO and AuRico responded to all questions and comments raised at the community meetings. EAO provided proceedings of the meetings to KwN and TLFN following the meetings.

Throughout the EA review TKN participated in Working Group meetings and provided detailed technical comments as members of the Working Group. EAO's collaboration with TKN extended to the technical review, as EAO and TKN worked through TKN's technical comments together in an effort to come to a common understanding of the issue or concern, options for addressing the issue through the EA process, and/or how the issue or concern could be addressed through subsequent permitting or other fora, should an EAC be issued for the KUG Project. These technical comments are discussed in detail in Part B of this report, and all of TKN's comments and AuRico's responses are documented in an issues tracking table.

EAO and TKN identified the need for three sub-working groups to address the issues that were raised by TKN and other members of the Working Group: geochemistry, water and wildlife. TKN participated in these sub-working groups that met throughout the Application review phase to discuss and resolve issues.

TKN provided EAO with their proposed conditions for an EAC on October 27, 2016. EAO met with TKN and permitting agencies to discuss TKN's proposed conditions to understand the TKN's concerns and develop appropriate EAC conditions. EAO and TKN came to a general agreement on the conditions appropriate to propose for the EAC and the issues that would be adequately addressed through subsequent permitting

processes.

EAO and TKN collaborated on the drafting of this section of Part C. Collaborative drafting involved the following steps:

- TKN developed a report titled *"Assessment of the Impacts of AuRico Metals Inc.'s proposed Kemess Underground Mine Project on the Aboriginal Title, Rights and Interests of the The Tsay Keh Nay (Kwadacha First Nation, Takla Lake First Nation and Tsay Keh Dene)"* (the Eco Report);
- The Parties collaboratively developed an outline of the proposed contents of the collaborative Part C;
- TKN presented an initial draft of Part C on Dec 4, 2016; and
- EAO and TKN shared and discussed suggested edits and additions to the initial draft between December 4, 2016 and January 10, 2017.

The content of this Part C represents consensus between EAO and TKN, except where otherwise stated.

EAO's initial views of strength of claim in the KUG Project area and the scope of consultation were communicated separately to each of the TKN First Nations by letter on March 19, 2014. A draft post-*Tsilhqot'in* updated assessment was presented to the TKN First Nations on June 9, 2016 for discussion. TKD responded to this draft updated assessment on October 20, 2016 and KwN responded on November 2, 2016. In response to further information provided by TKD, EAO further revised its assessment for TKD and TLFN (the information provided by TKD was also relevant for TLFN) and shared that assessment on December 14, 2016.

EAO and TKN agreed early in Application review that the primary focus of their engagement in the EA should be on collaboration and a non-adversarial, interest-based approach. TKN and EAO agree that the collaboration process for the KUG Project is capable of satisfying the requirements of the deeper end of consultation for the EA. However, TKN and the Province agree that environmental and other accommodation measures may be required for the KUG Project to address outstanding impacts on the Aboriginal title, rights, and interests of the TKN First Nations. TKN and the Province are currently pursuing discussions in relation to those measures at a separate government-to-government (G2G) table that has been established outside of the EA process and through the permitting process for the KUG Project.

11.5 Proponent Consultation

Under Section 11 of the Act (Section 11 Order), EAO ordered AuRico to consult with Aboriginal groups about the potential effects of the KUG Project on their Aboriginal

Interests, and measures to avoid or mitigate potential adverse effects and/or otherwise address or accommodate the concerns of those Aboriginal groups, as appropriate. The Section 11 Order prescribed a process for developing, conducting and reporting out on this consultation.

Consultation Process – Pre-Application and Application Review

AuRico's consultation with TKN has involved various agreements, arrangements, committees, meetings and reporting that spanned pre-Application and Application review. These measures are described below. Consultation specific to each phase of the EA are further detailed in their respective sections below.

Agreements and Arrangements between AuRico and TKN

AuRico and TKN have established the following agreements and arrangements:

- Interim Measures Agreement (June 2012);
- Exploration Agreement (2013-2014 and 2015-2016 field seasons);
- Joint Communication Plan (Updated March 2015);
- Environmental Assessment Conduct Agreement (June 2014); and
- Employment and Contract Opportunities Framework (March 2015).

These agreements and arrangements have guided and informed AuRico and TKN consultations.

In April 2015, AuRico and TKN began to negotiate an IBA for the KUG Project. AuRico and TKN met through 2016 to continue the IBA negotiations.

Joint Committees

The IMA establishes a Senior Implementation Committee and an Environmental Management Committee with representatives of each of the parties to the Agreement. Since May 2013, the Senior Implementation Committee has generally met every month and the Environmental Management Committee has met or had calls every two weeks up until submission of the Application. Both committees continued to meet during Application review.

Employment and Training

One of the objectives of the IMA is to identify business opportunities and employment opportunities for TKN. This includes building capacity by promoting, encouraging and facilitating the use of qualified individuals and businesses from TKN communities, where possible, to supply goods and services during all phases of the KUG Project.

Community Meetings

Since the start of the EA process, AuRico has hosted or attended 11 meetings about the KUG Project in TKN communities including in relation to the water discharge assessment.

Consultation Plans and Reports

AuRico produced the following consultation plans and reports through the EA:

- October 2014 Aboriginal Consultation Plan;
- February 2015 Interim Pre-Application Aboriginal Consultation Report;
- March 2016 Pre-Application Aboriginal Consultation Report;
- July 2016 Application Review Aboriginal Consultation Report; and
- December 2016 Application Review Aboriginal Consultation report.

AuRico provided draft plans and reports to the TKN First Nations and incorporated feedback prior to submitting final plans and reports to EAO.

Capacity Funding and Agreements

- AuRico provided funding to TKN's third-party consultants who supported TKN's review of the Application; and
- AuRico also provided funding to TKN to support its participation in the EA of the KUG Project.

Consultation Process - Pre-Application

In 2011, AuRico held a series of community meetings in Takla Landing, Kwadacha, and Tsay Keh, which provided an opportunity for AuRico to present the KUG Project, discuss potential environmental concerns, as well as to discuss training, jobs, and business opportunities.

AuRico has held numerous meetings with TKN and has hosted site visits for TKN members. The meetings and associated correspondence have helped to identify the Aboriginal title, rights, and interests of the TKN First Nations that may be affected by the KUG Project, provide updated information about the KUG Project, and build relationships between TKN and AuRico. A detailed description of AuRico's consultation with TKN during the pre-Application phase can be found in the following Aboriginal Consultation Reports submitted to EAO by AuRico: March 2016 and July 2016.

Water Discharge Alternatives Assessment

AuRico met with TKN on December 14, 2014 to review and seek comments on the proposed approach to assessing the water discharge alternatives. AuRico considered traditional and current use information in the water discharge alternatives assessment and attended community meetings in each of the TKN communities to review the assessment. AuRico held meetings of the Environmental Management Committee to complete the value-based decision process of the alternatives assessment. TKN indicated their preferred discharge option was to Attichika Creek due to its proximity to the KUG Project and perception that the creek has already been affected by KS. AuRico met with TKN on November 4, 2015 to present Attichika Creek water quality discharge predictions. This included presentations on the optimization of the Attichika Creek option, water quality modelling for Attichika Creek, and the removal of metals and Se.

Consultation on the content of the Application

AuRico provided a draft of the VC Scoping Document to TKN and incorporated TKN comments into the document in advance of Working Group review. TKN commented on all aspects of the AIR including the following key topics:

- EA methodology;
- Assessment of potential environmental effects including water management;
- Assessment of potential social effects;
- Accidents and malfunctions;
- Effects of the environment on the KUG Project;
- Environmental management and monitoring plans;
- Aboriginal rights and title; and
- Aboriginal consultation.

AuRico provided a copy of the Application to TKN and the Environmental Management Committee on January 11, 2016, 45 days prior to submitting it to EAO for Application evaluation. TKN submitted comments on the Application which included the following topics:

- Alternative means of tailings management;
- Fish and aquatic habitat: analysis methodology and standards used to determine the potential effects on fish and aquatic health VCs; rationale for choosing the VC indicators;
- Wildlife: applicability and consistency with various wildlife-related guidance and policies; effects from year round maintenance of the ORAR; and methodology and standards used to determine effects and limitations and assumptions; reliance on and incorporation of traditional ecological or community knowledge relevant to terrestrial ecology and wildlife; baseline wildlife conditions; bio accumulative COPCs (Hg and Se) and exceedances of tissue residue guidelines in fish for consumption by wildlife;
- Wetlands: applicability of the Federal Policy on Wetland Conservation;

- Water: Baseline hydrogeological, hydrological, surface water quality conditions; surface water quality effects assessment and effects due to a failure of the KS TSF; water balance and water quality modeling including source term development;
- Current baseline conditions and cumulative effects; and
- Incorporation of traditional use information into mitigation and management plans.

AuRico submitted the Application for evaluation against the AIR on March 3, 2016. In response to AuRico's request to allow additional time for AuRico to respond to comments from the Working Group including TKN, EAO issued an order on April 4, 2016 to extend the evaluation period by 20 days.

Consultation Process - Application Review

On August 4, 2016 EAO suspended the 180-day Application review phase in response to AuRico's request for an eight week suspension in part to allow time for TKN to better engage their communities. AuRico's request for suspension was accompanied by a letter of support from TKN stating the importance of community engagement on the EA of the KUG Project to TKN.

TKN submitted technical comments on the Application on June 26, August 23, September 7 and 9, October 7, and November 23, 2016.

TKN's comments of June 26, 2016 included the following topics:

- tailings and water management;
- water quality predictions;
- characterization of baseline conditions;
- effects assessments related to noise, wetlands, wildlife, fish health, traditional food sources, TKN harvestable plants, accidents and malfunctions, and cumulative effects; and
- contingency planning during post-closure.

TKN's comments of August 23, 2016 related to groundwater divide.

TKN's comments of September 7 and 9, 2016 included the following topics:

- accidents and malfunctions;
- closure and reclamation;
- EMPs;
- geochemistry;
- groundwater;
- tailings and waste rock management; and

- water (quality and treatment).

TKN's comments of October 7, 2016 included the following topics:

- wildlife and habitat including methods for the residual and cumulative effects assessment;
- fish and aquatic habitat;
- terrestrial ecosystems; and
- accidents and malfunctions.

TKN's comments of November 23, 2016 included the following topics:

- Se monitoring program;
- effects assessment for fish and water VCs;
- recommendations related to development of monitoring and management plans.

11.5.1 TKN's Views on Proponent Consultation

AuRico Gold (the predecessor to AuRico Metals) initiated consultation with TKN regarding the KUG Project shortly after acquiring the Kemess property from Northgate Minerals early in 2011. This followed an earlier and often acrimonious environmental process in which Northgate was proposing to build and operate an open pit mine at Kemess, KN. This proposal included a plan by Northgate to store tailings from its mining operations in Amazay Lake – a plan that was vigorously opposed by TKN.

TKN's view is that since initiating consultation with TKN in 2011, AuRico has consistently made good faith efforts to build a respectful and constructive relationship with TKN and overcome the mistrust within TKN communities that was created by Northgate's KN proposal. A key outcome of these efforts by AuRico was the IMA signed by TKN and AuRico in 2012. TKN's view is that the IMA has been pivotal in fostering collaboration and mutual understanding between TKN and AuRico and, ultimately, building trust. Importantly, the IMA created a framework in which TKN collectively and individually were able to raise their concerns, interests and priorities and freely exchange views and information with AuRico. This exchange of views and information has been robust, constructive and largely non-adversarial.

In 2014, TKN and AuRico signed an EA Conduct Agreement. The EA Conduct Agreement was designed to build on the IMA including the structures and processes in the IMA. Under the agreement, TKN received funding and other forms of support from AuRico to enable TKN to participate in the EA process for the KUG Project. This included funding for TKN to employ independent experts to review baseline studies and advise TKN on a wide range of technical issues. TKN's view is that the ability of TKN to

draw on and obtain advice from independent experts has been crucial in ensuring that TKN concerns and interests are adequately presented and considered in the EA process for the KUG Project. It has also served to build greater confidence within TKN communities in the information presented by AuRico in its EA Application and in the EA process in general.

TKN notes that even though the exchange of views and information with AuRico has been robust and constructive, TKN has identified issues or concerns, including gaps in information, that cannot be adequately addressed in the EA process because of the current state of design and planning for the KUG Project. In recognition of this, TKN has been assured by AuRico that efforts will be made in the MA and EMA permitting processes that are currently under way to address these issues and concerns. To that end, an agreement exists for collaboration by TKN and AuRico in developing applications for permits and authorizations, monitoring and management plans and other matters. This agreement for collaboration on permitting will form part of the IBA that TKN and AuRico are negotiating for the KUG Project.

Also, TKN underscores that collaboration by TKN and AuRico has not always produced agreement by the parties on key issues. Areas of disagreement include the assessment by AuRico of the effects of the KUG Project on the Aboriginal title, rights, and interests of the TKN First Nations including the ability of TKN to meaningfully exercise those rights. Yet, despite these differences TKN and AuRico have gained a deeper understanding of each other's views and interests and through this mutual understanding, progress has been made towards an IBA.

Under the IMA, TKN and AuRico agreed to negotiate an IBA. This IBA will address a broad range of TKN interests including (among other things) employment and training, business opportunities for TKN businesses associated with construction and operation of the KUG Project, a financial component, and specific arrangements for environmental protection including a role for TKN in environmental management of the KUG Project. A key feature of the IBA is a commitment by both TKN and AuRico to maintain and strengthen, throughout all phases of the KUG Project, the collaboration and constructive engagement that characterized the relationship of TKN and AuRico under the IMA.

TKN and AuRico are close to finalizing the IBA, but before the IBA can be ratified by TKN communities, TKN is of the view that progress must be made by TKN at the G2G table created by TKN and the Province for the KUG Project. Despite this, TKN acknowledges the efforts made by AuRico to conclude an IBA with TKN that, combined with the G2G table, will create the conditions in which the KUG Project can be

approved, developed and operated successfully and responsibly for TKN, AuRico and all British Columbians.

11.6 Aboriginal Title, Rights, and Interests of the TKN First Nations

The following community profiles (sections 11.7.1, 11.7.2 and 11.7.3) were provided by the TKN First Nations and represent their perspectives.

11.7 TKN Community Profiles

11.7.1 Takla Lake First Nation

TLFN or Takla is a "band" within the meaning of that term in the *Indian Act*, RSC 1985, c I-5. In terms of its structure as a "band" under the *Indian Act*, Takla is an amalgamation of the North Takla Band and the Fort Connelly Band, a union which occurred in 1959.Takla's main community is located at Takla Landing on IRs 7, 7A, 9, and 12, which are situated approximately 320 km north of Prince George, BC, on the eastern shore of *Tatl'ah Bun* (aka "Takla Lake"). Takla has 13 other reserves in the immediate environs of *Tatl'ah Bun*, and a total registered population of about 800 individuals. Takla and its members are "aboriginal peoples of Canada" within the meaning of s. 35 of the *Constitution Act, 1982*.

Takla describes its traditional territory as totaling approximately 27,250 km^2 (see area identified in Figure 14), and is a rich environment of lakes, rivers, forests and mountains, bordered on the west by the Skeena Mountains and on the east by the Rocky Mountains (Territory).

Sekani[31] place names exist for certain physical features and places of importance in the Territory. Each name reflects the significance of the feature or site, and today provides Takla with historical information to the rich history and extensive knowledge of the Territory and resources within it.

Takla is a member Nation of the Carrier Sekani Tribal Council (CSTC), which is a society formed under the BC *Society Act* and governed by a Board of Directors comprised of the Chief Councillors from each member nation. CSTC was incorporated in 1979 with a view to, among other things, achieving a just resolution of land claims and Aboriginal rights issues for the Carrier and Sekani peoples.

[31] "Sekani" is described below in Section 11.7.2

In 1982, CSTC, on behalf of Takla and the other member Nations, filed a Comprehensive Land Claim with the Government of Canada. That claim was accepted for negotiation in 1982. CSTC, on behalf of Takla and its other member Nations, also filed a statement of intent with the BC Treaty Commission in 1994. Although not currently under active negotiation, Takla and other CSTC member Nations attempted to negotiate an “agreement in principle” as contemplated by Stage 4 of the treaty process, starting in 1997.

As is the case with the other CSTC Nations, Takla identifies that it has never ceded, released or surrendered its Aboriginal title, rights or interests to the Territory, nor have any events occurred which would operate to otherwise extinguish such Aboriginal title, rights or interests. Accordingly, Takla has identified that it continues to hold Aboriginal title, rights, and interests in and to the Territory.

In April 2015, Takla, six other CSTC member Nations, and the Crown in right of BC concluded a CA in which the Province “recognizes the existence of Carrier Sekani Aboriginal title and rights in the Territories,” while agreeing that further processes are required to establish the scope and geographic extent of Aboriginal title and rights in the CSTC Territories.

11.7.2 Tsay Keh Dene

Historical Background

The TKD are culturally “Sekani”, often translated as “people of the rocks” or “people of the mountains”. The Sekani are generally known as the inhabitants of the northern Rocky Mountain Trench.

The name “Sekani” is an ethnolinguistic designation that refers to the people who speak an Athapaskan dialect called Sekani. However, it also refers to a distinct social and cultural group defined by a common social organization, customs, subsistence practices and generally recognized territorial boundaries. TKD are primarily descended from the Sasuchan and Yutuwichan regional bands or sub-groups of Sekani (two of five original Sekani sub-groups).

TKD is often associated with the native people who traded and lived at Fort Grahame, a trading post established in 1867 on the east side of the Finlay River north of its confluence with the Peace River. A reserve was eventually allotted at Fort Grahame to the Fort Grahame Band, a predecessor of the TKD First Nation.

In the 1960s, the Province developed the W.A.C. Bennett Dam and the Williston Reservoir to supply low cost electricity to British Columbians. To create the reservoir, more than 100,000 ha of TKD territory were flooded including TKD villages, graveyards, prime hunting, trapping and fishing grounds, and other significant sites. TKD oral history reveals that the loss, disruption and dislocation caused by the flooding of the Williston Reservoir were devastating for the TKD people. The social, cultural and economic effects of this event, including collective trauma and a deep sense of loss, persist more than fifty years later.

Communities and Population

TKD is a First Nation with a population of 490 members. The main community of TKD (often referred to as “Tsay Keh”) is located at the north end of the Williston Reservoir, approximately 350 km northwest of Mackenzie and 520 km northwest of Prince George. Tsay Keh was established in the 1990s following the destruction of TKD homes and villages on the Finlay River by the Williston Reservoir flooding. Approximately 230 TKD members reside in Tsay Keh. However, this number is expected to grow as TKD implements an ambitious plan to increase its housing stock.

Tsay Keh can be reached from Prince George by road or air. Travel time by road is eight to ten hours depending on road and weather conditions. Travel by road during the spring thaw can be difficult as it includes approximately 300 km via unpaved logging roads. By air, Tsay Keh is serviced by Ootsa Air, a company in which TKD is a shareholder. Travel time by air is one and a half hours.

Blackpine is a small TKD community on the ORAR and Mesilinka River. The population of Blackpine is roughly 20, but this number is growing. TKD has plans to expand the community at Blackpine despite concerns about increased industrial traffic through Blackpine. Also, a significant number of TKD members live throughout TKD’s traditional territory in remote homes or cabins. The balance of TKD members live in cities or towns including Prince George and Mackenzie.

Traditional Territory and Reserves

TKD’s traditional territory is vast and encompasses more than 3 M ha. This territory extends to Mount Trace in the north, west to South Pass Peak, south to the Nation River and east to Mount Laurier. The KUG Project is within this traditional territory. TKD indicate that they historically made regular and extensive use of its territory for a wide range of activities within a highly organized seasonal round. Despite the effects of colonization and escalating industrial activity in TKD territory, many TKD members, like

their ancestors, still regularly pursue traditional activities on their traditional lands.

TKD currently has three reserves: Police Meadow IR No.2, Tutu Creek IR No. 4, Parsnip IR No. 5. Police Meadows was originally 640 acres in size, but following a review by Ditchburn and Clark in the 1920s the reserve was reduced to 320 acres. Police Meadows is currently the site of a mixed farming operation carried on by TKD. TuTu Creek and Parsnip were allotted to TKD in partial compensation for the destruction of other reserves (the Fort Graham and Finlay Forks reserves) when the Williston Reservoir was created. However, TuTu Creek and Parsnip are not within TKD traditional territory and are not used or occupied.

Tsay Keh and Blackpine are “federal lands” held for TKD, but are not officially reserves. The process to add these lands to reserve is ongoing.

Governance

TKD has an elected Chief and Council. Chief and Council are elected for four year terms. Elections are conducted pursuant to a custom election code developed and adopted by TKD in 2012.

TKD maintains administrative offices in Tsay Keh and Prince George. TKD employs more than 60 people in its administrative offices, a majority of whom are TKD members. Financial and program administration are centralized in TKD’s Prince George office. To augment its capacity, TKD also employs professional advisors or consultants under short or longer-term contracts.

Education and Training

TKD has a school in Tsay Keh for students from kindergarten to grade 12. Fifty students are currently enrolled in the school. The school combines the regular curriculum with teaching of the Sekani language and culture.

TKD has members who are enrolled in post-secondary institutions at the diploma, undergraduate and postgraduate levels.

TKD operates an Adult Learning Centre, a new state of the art facility completed in 2014. The programs offered through the Adult Leaning Centre include adult upgrading programs and trades or specialized training delivered in partnership with industry and the College of New Caledonia. TKD is a member of the Indigenous Adult and Higher Learning Association and the First Nation Education Steering Committee.

Economic Development

Since the early 2000s, TKD has invested in economic development initiatives designed to increase its own source revenue and create employment and other opportunities for its members. At present, Tsay Keh operates several successful businesses including Chu Cho Industries (specializing in road building, trucking and logging), Chu Environmental (specializing in environmental services), Chu Cho Forestry (specializing in silviculture, timber development and planning and project management), and Tsay Keh Developments (specializing in backcountry adventures and guide outfitting). TKD also operates Ingenika Trading Post, a saw mill, a mixed farming business at Police Meadows and is a shareholder of Ootsa Air.

11.7.3 Kwadacha

In 1920, Fort Ware was a trading post and the elders/ancestors of what is now Kwadacha, used to stop for supplies during their travels to and from hunting camps. KwN and TKD were once one First Nation who lived in Fort Grahame. In 1959, the two bands Kwadacha and Tsay Keh were known as the Finlay River Band and were then displaced in 1968 due to the creation of the W.A.C Bennett Dam. The Finlay River Band then divided into the Fort Ware and Ingenika bands in 1970. The Fort Ware Band later became known as the KwN.

For generations, the people of KwN have lived and thrived along the Finlay River and throughout KwN Traditional Territory. KwN is made up of people of Tsekene (Sekani) and Kaska Dene descendants, and is also a part of the Kaska Dena Council which was formed in 1981.

For years, there was no permanent road access, which meant the members could only get in and out by air for medical services and the cost of freighting groceries/supplies was extremely high. Today, there is access via the Finlay Forest Service Road through Mackenzie, and is measured roughly 570 km from the nearest service center of Prince George.

KwN has a custom election system, consisting of a Chief and deputy Chief whose terms run for four years and three councillors whose terms run for three years.

The total registered population of the KwN is 561, with 258 members living off–reserve and 303 living on-reserve.

Departments of Kwadacha Nation

Support services for the KwN are provided through the departments of Health, Education, Economic Development, Lands and Resources, Housing and community service, Finance and Administration.

Health

KwN strives to build a healthy community, healthy families and a healthy environment; socially, physically and mentally. The Health Department consists of a Health Director who oversees the department. In the Health Center we have a physician two days per month, nurses 24-7, mental health counsellor, drug and alcohol counsellor, a dentist and dental hygienist who both are in the community every two months, two licensed home care assistants and four home care aides. Also included in the health department are; Justice/MCFD Liaison, Youth Counsellor, Community Health Representative, Health Clinic Clerk, Patient Travel Clerk (based in Prince George), MCFD Social Workers (part time in community), Drinking water tester Coordinator (part time), and the Aboriginal Infant Development Program.

The health department with the collaboration with health professionals work together to create efficient systems for health resources in the community. The target patient group has access to the above primary health care services.

Education

Education in Kwadacha is administered by the Kwadacha Education Society. The Purpose of the Society is to provide educational opportunities to all members of the KwN, promote educational excellence in Kwadacha and to take advantage of educational funding opportunities only available to a registered society. The Society consists of nine Directors. Seven of the directors have voting rights, Chief and Council hold one of those voting directorships.

The Kwadacha Education Society administers the Kwadacha Daycare, Aatse Davie School, Kwadacha Dune Tii Centre (Adult Ed) and Post-Secondary programs. The Daycare is licenced as a multi-age facility with a capacity of 12 children. Aatse Davie School is a certified independent school from Kindergarten to grade 12 with 100 Students. Kwadacha Dune Tii Centre has 12 full-time students and the Post-Secondary program is currently supporting 5 full-time students.

Economic Development

The KwN Economic Development office oversees all economic development initiatives as well as providing employment and training opportunities for the members. The economic development department also helps with resume writing in order for members to attain employment. The main goal of the department is to create as much employment for the members as possible while achieving economic opportunities.

Lands and Resources

The Lands and Resources department is responsible for taking care of the KwN Traditional Territory. In 2012, the KwN, as a member of the Kaska Dena Council, entered into a Strategic Engagement Agreement with the province of BC as a tool to ensure that referrals are handled in a G2G decision making process. The Lands and Resource staff help manage Fish and Wildlife, land use planning and forest management planning. The Lands department oversees all work with mining, forestry and environmental issues in the territory.

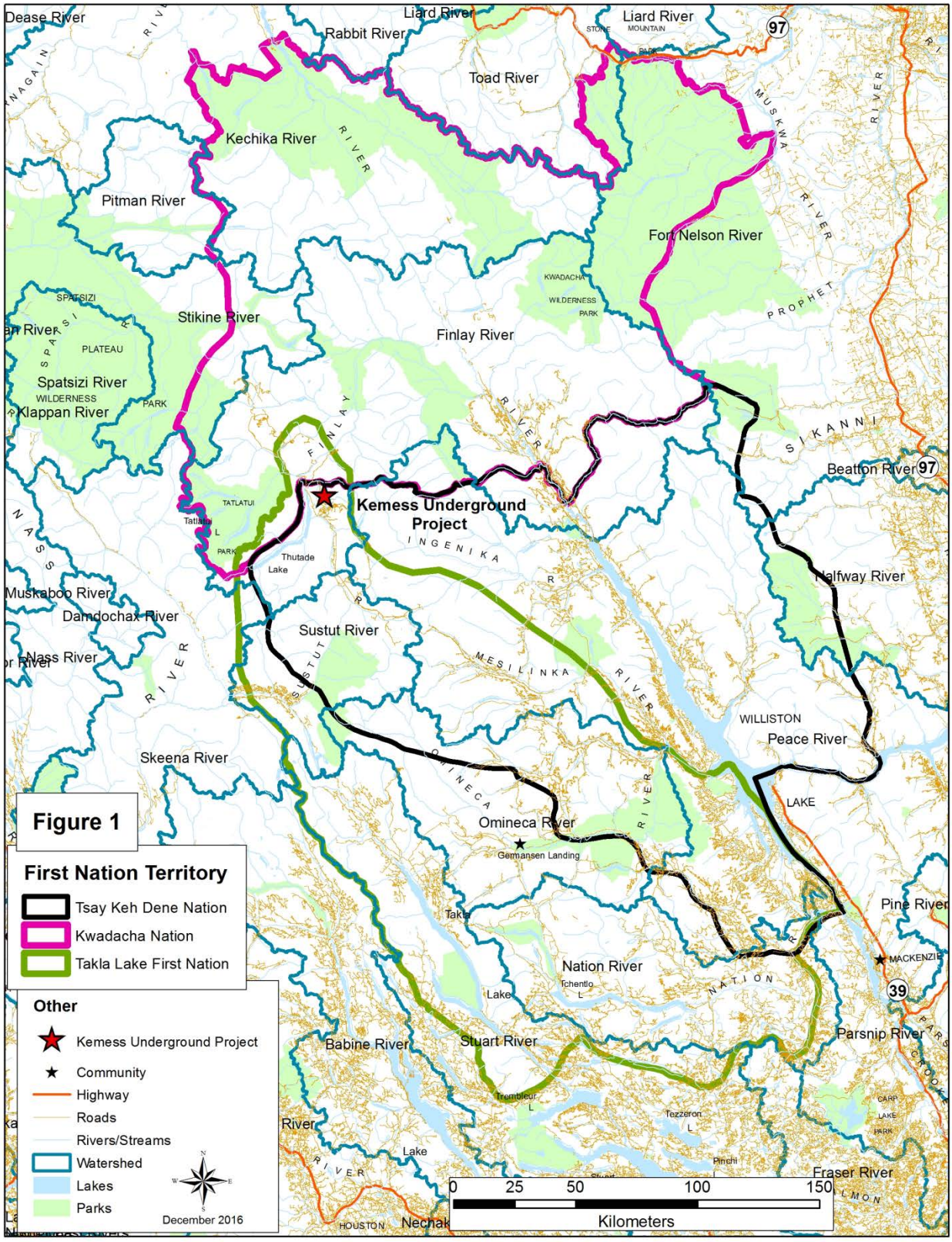
Housing and Community Services

Housing and Community services are responsible for all the houses, community buildings and infrastructure that belong to the KwN. Community services oversee the maintenance for all of Kwadacha as well as the operation and maintenance of the community buildings, including the Store, Restaurant, and the Administration building; it also has a full maintenance program and full time crew. Housing also has a housing committee who oversee the distribution of houses when they are built.

Finance and Administration

Kwadacha's Finance and Administration department oversees all of Kwadacha's finances including employment and payroll. The department also provides social assistance for those that are unemployed and also provides assistance to elders. Most finance and administration is done from the Prince George office; however, the Fort Ware office oversees the human resources portion and assistance for all the needs of the community and members as this is the main office of the KwN.

Figure 14: Traditional Territory Map of each of the TKN First Nations



11.8 Description of Aboriginal Title, Rights, and Interests of the TKN First Nations

The following descriptions of the Aboriginal title, rights, and interests of the TKN First Nations (sections 11.8.1, 11.8.2 and 11.8.3) were provided by the TKN First Nations, and represent their perspectives.

11.8.1 Takla Lake First Nation

Takla describes its ancestors as having occupied, hunted, fished, gathered, travelled, governed, acted as stewards of, and raised families on the lands waters within its traditional territory as identified in Figure 14 (Territory) since time immemorial. The lands and waters have provided Takla people with spirituality, sustenance, economy and transportation. Further, Takla's ancestors historically operated according to legal orders that governed their peoples' use of lands, waters and natural resources, which is the source of Takla's stewardship practices today.

Takla describes its Territory as the geographic area that Takla's ancestors lived in, occupied, defended, hunted, fished, gathered, travelled, governed, acted as stewards of, and raised their families on the land, waters and resources since time immemorial. The abundant natural resources within the Territory have enabled Takla and its members to live, thrive and maintain its spiritual connection with the land, the Creator and Takla's ancestors.

Despite a degree of interruption caused by modern factors including ongoing industrial development, Takla members continue to rely on a variety of resources, live in villages, occupy semi-permanent campsites and harvest resources on a regular and seasonal basis throughout the Territory. Takla has identified that Takla holds Aboriginal title throughout the Territory, including Aboriginal title to the land, waters, airshed and river and lakebed areas. Takla also identified important Aboriginal rights and interests, including governance, cultural, spiritual and harvesting rights.

Accordingly, Takla has identified that Takla holds Aboriginal title, rights, and interests throughout the Territory, including to the lands, waters, airsheds and resources therein.

Takla has identified specific Aboriginal title, rights, and interests that would be adversely impacted by the KUG Project. These Aboriginal title, rights, and interests are described individually below, but are often closely tied to one another, with impacts on one having potentially wide-ranging impacts on others.

Takla's view is that Aboriginal title is properly regarded as carrying with it the right to possess lands in the Territory and exclusively occupy, use and control the Territory for its members' benefit. Takla refers to case law of the Supreme Court of Canada that Takla views as confirming that Aboriginal title includes incidental rights to (i) exercise authority and jurisdiction over, (ii) decide on current and future uses, and (iii) actively use and manage its Territory, including the water, land, air and resources therein, in accordance with Takla's laws, customs and practices.

Takla describes these concepts as closely tied to the right or ability to benefit from uses of the land and the resources therein, or put another way, Takla's economic interests. This includes deriving benefits from the Territory and pursuing economic development opportunities in a variety of ways; whether related or unrelated to modern forms or natural resource development and extraction. Takla views this as encompassing access to natural resources by preferred means, to include use of wild foods for the contemporary Takla community and its ancestors, as well as for sale, trade, or barter as Takla's ancestors did historically.

Additionally, Takla describes continuing to govern and conduct itself in a manner which is respectful of certain customary principles of environmental integrity and stewardship. For example, it continues to require regular access to an environment that is not significantly degraded and is capable of sustaining (i) the ecosystems therein, (ii) a robust subsistence economy and (iii) Takla and its members both today and into the future.

Prior to contact with Europeans, Takla describes historically operating in accordance with a legal order that governed the use of lands, waters and natural resources (a system of individual landholding or occupation called *K'eyukh*). This forms the basis for stewardship practices today. This stewardship governance practice corresponds to a well-established legal mandate under customary law which requires Takla to manage the lands and resources in the Territory in a sustainable way. This springs from, and sustains a legal responsibility imposed on Takla by its own system of laws that dictates how lands must be managed and resources must be harvested.

Takla therefore continues to use its lands and resources in a manner reflective of its historical and inherent role as steward of the Territory, including by using its detailed collective knowledge and historical occupation of the Territory to maintain an understanding of its overall health and to ensure long-term sustainability. Significant numbers of young Takla adults continue to use lands and resources within the Territory today. This is a strong indication of Takla's continued, strong relationship with the land in the Territory, and Takla's future ability and capacity to act as stewards in that regard.

Takla's stewardship obligations require it to sustain healthy ecosystems in the Territory, including through the K'eyukh system's allocation of resources, with a view to maintaining these resources as a viable foundation for Takla members' sustenance and culture, both today and for the benefit of future generations. Consulting with, and receiving direction from, members and K'eyukh holders is also a vital aspect of Takla's approach to stewardship.

Coupled with these practices related to environmental integrity and stewardship is the act of actually accessing, harvesting, using and enjoying the benefits of natural resources for desired purposes – for cultural, ceremonial, spiritual, subsistence, economic and/or other reasons – and to do so in a preferred manner. Incidental and essential to this is the ability to safely travel unobstructed over the lands and waters throughout the Territory.

Specific resources that are of historical and contemporary importance to Takla include the following:

- a variety of fish, including salmon, whitefish, char, trout, ling and suckers;
- large and small game, including caribou, moose, mountain sheep, goats, bear, rabbit, marmot, porcupine, beaver, otter, squirrel, marten, fisher, lynx, wolverine, grouse and a variety of waterfowl;
- berries (including rose hips, lingonberries, high-bush cranberries, soapberries, strawberries, raspberries, huckleberries, kinnikinnick and crowberries) and roots, fruits, mushrooms, tree cambium, shoots, leaves, flowers and lichens associated with a broad variety of plants;
- trees, for firewood, structural, and medicinal purposes; and
- earthen material, such as stones and gravel.

Essential to carrying out these practices and accessing these resources, and vice versa, is the maintenance of individual and community health, which is itself comprised of maintaining conditions conducive to healthy bodies, minds, and spirits (i.e., to the intertwined environmental, cultural, spiritual, social and economic conditions that ensure the well-being of individuals and of Takla as a whole). This cannot be achieved without equitable socio-economic conditions for Takla and its members.

Of particular concern to Takla at present is the preservation of its forest resources. The Territory's forests in particular have always been and remain a vital, irreplaceable part of Takla's traditional way of life and practices. They are home to the animals that Takla members hunt and trap, and the plants, medicines and timber that are harvested and used for consumption, ceremony, economy, traveling via trails, art, to bury the dead,

and to build homes and hunting cabins. Takla's way of life cannot be readily separated from the forests that surround it and its members. Takla and its members are part of the forest, and vice versa.

The increase in logging in recent years in the Territory has been a central and growing concern to Takla and its members. Takla reports that the Territory holds one of the last remaining significant expanses of forest in the region, and as such in the last few years has increasingly become the target of numerous logging companies. Already, Takla is seeing evidence of many significant and adverse impacts from these activities.
It appears to Takla that there is too much timber harvesting happening too quickly.

Significant volumes of timber have already been removed from the Territory, and many logging trucks continue to leave the Territory loaded with logs from trees in the Territory every day. These forestry activities continue to cause very significant damaging effects to the Territory and the wildlife that lives in it, including in particular to caribou, grizzly bears and fur-bearing animals that remain central to Takla's way of life, sustenance and spirituality.

To Takla, the significant proposed increase in logging activity is one of many ongoing impacts in the Territory that now tangibly threaten Takla's way of life. Significant portions of the Territory have already been lost to land alienation. Uses attributed to mining and Crown expropriation or other use and rights-of-way have removed significant tracts of harvesting lands. Takla views this alienation as already having caused significant impacts on Takla's use of their Territory, and the cumulative impact of all these activities appear to be of overwhelming importance with respect to Takla's Aboriginal title, rights, and interests. For that reason, the impacts of an additional resource extraction project (and increased resource extraction by existing projects) are of utmost concern to Takla. This is particularly true in relation to the KUG Project.

Finally, there are also many archaeological, spiritual and cultural sites and practices throughout the Territory which are of prime importance to Takla and its members. The survival of Takla's unique culture depends on the preservation and protection of both the existence and sanctity of these important archaeological, spiritual and cultural sites and to ensure they are kept physically intact for current and future generations.
In addition to maintaining Takla and its members' connection to the land, such uninhibited, undisturbed, and private access to these sites is essential to fostering Takla's ongoing sense of community (including elder-youth interactions) and providing traditional knowledge holders and elders with opportunities to share history, knowledge, traditional ways and skills with other members, including youth. What can or cannot occur at these key sites is of critical importance: of the many places of spiritual and

cultural significance to Takla throughout the Territory, included are many burial sites, places for acquiring spiritual powers, meeting and ceremonial grounds, and other places rich in oral histories and important to the teachings of Takla laws and culture. Takla's fasting ceremonies in particular cannot be carried out at these sacred places if they have been disturbed or altered.

11.8.2 Tsay Keh Dene Nation

TKD indicate that in the late 1700s, Sekani territory encompassed the areas drained by the Finlay and Parsnip Rivers (including the Nation River), Bear Lake and the upper Sustut River, Takla Lake and Driftwood River, and areas on the upper Stikine, Kechika and Liard Rivers. In the east, Sekani territory also encompassed the eastern foothills of the Rocky Mountains adjacent to the upper Peace River and extending to Rocky Mountain Portage. To the south, Sekani territory extended to the upper Pine and Moberly Rivers. By the mid-1800s, the territorial boundaries of the Sekani people were largely unchanged, albeit for some Sekani regional bands or groups travel to the foothills on the east side of the Rocky Mountains became less common due to conflict with the Beaver Indians.

The Sekani way of life was characterized by a seasonal round by which the Sekani sustained themselves. In that seasonal round, the Sekani made regular use of large parts of their territories for hunting, fishing, trapping and gathering. However, this seasonal round was by no means random or haphazard. Rather, it was based on a long period of highly skilful adaptation by the Sekani to their physical environment. This resulted in clearly discernible patterns of movement by the Sekani over well-defined areas as they drew on and exploited the resources available to them.

Within Sekani territorial boundaries, Sekani regional bands or groups maintained their own hunting and resource gathering territories. Access to these hunting and resource gathering territories is described as limited to Sekani regional bands or groups. Sekani society was highly egalitarian and the sometimes harsh environment in which they lived fostered a strong ethic of cooperation, mutual dependence and sharing. However, this liberality within the Sekani regarding access to hunting and resource gathering territories did not extend to outsiders.

Long before the arrival of Europeans, the Sekani made use of the rivers and other water courses within their territory for fishing and as a conduit for travel, trade and social interaction. The Finlay, Parsnip, Manson, Omineca, Ingenika, Ospika, Mesilinka, Sustut, Nation and Peace Rivers (among others) were a vital part of this network. Likewise, these water courses provided convenient access for the Sekani to a profusion of well-established trails for travel to other parts of their territories including camping and

resource gathering sites. This system of trails was an integral part of the territories of the Sekani regional bands or groups who used them. In the journal of his 1824 expedition up the Finlay River, Samuel Black described these trails as “Thecannie Roads”. In 1913, Frank Swannell reported that “well opened” trails can be found in Sekani territory along almost every water course. Ethnographers appear to agree that only a small fraction of the trails used by the Sekani were recorded because large parts of Sekani territory were unexplored by cartographers until the twentieth century. (See Jenness’ description of part of this extensive network of trails[32]).

Ethnohistorical sources show conclusively that the ancestors of TKD regularly used and occupied the Finlay River and its watersheds. Fur trade records in particular are replete with references to Sekani use and occupancy of the Finlay River region. They also show that the Sekani were intimately familiar with this area and their resources and how to exploit them – knowledge that could only be gained through regular and extensive use of the areas for travel, camping and seasonal subsistence practices.

Like other First Nations, the Sekani lived under a system of customary laws. At the core of this system of customary laws was the basic principle that Sekani traditional territories were reserved for the use of Sekani bands or groups unless permission for access was obtained by outsiders. Jenness described this system as one in which “ownership of hunting territories … remained the property of the bands”. In fact, the oral histories of the Sekani people reveal that incursions by outsiders into Sekani territory without permission often resulted in swift retaliation. Jenness records that it was not uncommon for outsiders who ventured into Sekani territory without permission to be “killed without pity”. He recounts several stories in which Sekani people defended their territories against raids by others.

Sekani regarded the lands within their territories as belonging to them. This concept of territory and exercise of territorial rights by the Sekani was manifested by three main characteristics: 1) the dispersion of Sekani people over wide areas at fairly constant population densities; 2) the regular movement of Sekani people over their territories to exploit resources, pursue trade or socialize; and 3) resort to conflict when necessary to discourage or repel trespassers. (Lanoue, 1983)

Throughout TKD traditional territory including Thutade Lake and Amazay Lake, Sekani place names exist for lakes, rivers, mountains and many other geographic features of the landscape on which TKD and their ancestors sustained themselves and maintained their culture and way life. These place names are generally descriptive in nature in that

[32] Jenness, Diamond. “The Sekani Indians of British Columbia.” *Anthropological Series 20, National Museum of Canada Bulletin 84*. Ottawa: J. O. Patenaude, 1937. pp 2 – 5.

they are grounded in an interpretation of the landscape or embody important social or historical events, environmental knowledge, and spiritual and traditional teachings that define TKD and their ancestors as a people. TKD states that with these place names TKD and their ancestors affirmed their relationship to the lands and waters they used and occupied and, ultimately, their role as stewards of those lands and waters. TKD's view is that the existence and abundance of these place names across the landscape and their prominence in oral histories, stories and legends of the TKD people, is very strong evidence of the time, depth of use and occupation by TKD and their ancestors of their traditional territory.

Considerable historical evidence exists regarding regular use and occupancy of the KUG Project area by TKD's ancestors prior to and in 1846 and beyond. In 1806, Simon Fraser recorded an encounter with Sekani men who visited the NWC trading post at Rocky Mountain House. He noted that these men were very familiar with the upper reaches of the Finlay River to its source at Thutade Lake - knowledge that could only plausibly be gained through use of the area.

In 1824, Samuel Black recorded that on travelling to the upper reaches of the Finlay River, he met a Sekani man who belonged to a band that followed a Chief known as Methodiates. Through this Sekani man, Black learned that Methodiates' band was at Thutade Lake, the source of the Finlay River. Black subsequently met Methodiates and elicited from him detailed information on the band's use of Thutade Lake and surrounding areas. Black records that Thutade Lake was described by Methodiates as 'the best place for living". Black and his party later travelled to and explored Thutade Lake with the assistance of Sekani guides. In doing so, evidence exists that Black's party fished in Amazay Lake, a fishery with which the Sekani were very familiar (Littlefield, Dorricott and Cullon, 2006). Black's journal notes that while at Thutade Lake, he observed clear evidence of Sekani encampments along its shores. He ultimately concluded that, despite a request by Methodiates for the establishment of a trading post at Thutade Lake, a trading post on the upper Finlay was not a viable enterprise.

Fur trade records from the early 1800s also contain references to the use and occupation of the Finlay River by the Sekani. These references coupled with other evidence indicates that TKD's Sekani ancestors used and occupied the entire Finlay River and its watershed from its lower reaches at Finlay Forks to its headwaters at Thutade Lake. With the establishment of a trading post at Bear Lake in 1826, fur trade records show that use by the Sekani of Thutade Lake and surrounding areas for hunting and trapping intensified. (Littlefield, Dorricott and Cullon, 2006).

Historical accounts of TKD's use and occupancy of Thutade Lake and the surrounding area to the east in the first half of the nineteenth century is corroborated by TKD oral history. TKD oral history reveals that Thutade Lake, Amazay Lake and areas to the west

including Kemess Lake were regularly used by TKD's ancestors for a wide range of traditional activities included within the Sekani seasonal round. These traditional activities included (among others) hunting, trapping, fishing, gathering, camping and spiritual quests or ceremonies. Seasonal or temporary camps at Thutade, Amazay and Kemess Lakes were often used by TKD's Sekani ancestors when pursuing these traditional activities. To gain access to these areas, the Sekani followed well established trails that pre-dated the arrival of Europeans. Quite often, these trails were actively maintained by the Sekani. Trails from the Ingenika River and Finlay River (among others) led to and were extensively used by the Sekani to reach Thutade Lake, Amazay Lake and surrounding areas.

In "Tse Kay Nay Traditional and Contemporary Use and Occupation at Amazay (Duncan Lake): A Draft Report" by Littlefield, Dorricott and Cullon (2007), the authors present detailed information about Sekani historical and present use of the KUG Project area including Thutade Lake and Amazay Lake. This report by Littlefield et al. is entirely consistent with the oral history of TKD regarding their use and occupation of these areas. However, the report by Littlefield et al. is also noteworthy for its exposition of the spiritual significance of Thutade and Amazay to the Sekani people. Thutade and Amazay were regarded as places in which "hunting medicine" could be acquired or for spiritual quests by young Sekani men on reaching puberty. Thutade and Amazay are also the site of burials of Sekani men and women, several of whom feature prominently in Sekani stories. This deep spiritual attachment to Thutade and Amazay by TKD's Sekani ancestors attests to a long history of use and occupation of these areas by TKD and its Sekani ancestors.

11.8.3 Kwadacha Nation

The majority of historic evidence accumulated by previous TKN studies can be applied to Kwadacha, Takla, and TKD equally since Tsek'ene (Sekani) ancestors from all three communities used the Thutade area extensively before the establishment of HBC trading posts in or near each community. Tsek'ene (Sekani) people were very mobile, spoke the same language, inter-married, moved freely within the studied territory, and have a cultural history of sharing and supporting each other.

The significance of previous historical research as it applies to Kwadacha should be noted. Kwadacha's main ancestral origin is Tsek'ene (Sekani); its current political ties are Kaska. The distinction between cultural origin and political affiliations must be remembered in discussions of the Thutade/Upper Finlay area.

Clear evidence of the presence of Tsek'ene (Sekani) people in the Finlay River area and of their trail system is presented in Samuel Black's journal (1824). Black describes the well-known Methodiates, leader of the Tsek'ene (Sekani) people who inhabited the

Finlay River from the confluence of the Kwadacha River to the Thutade Lake area. Later records indicate Methodiates and members of his upper Finlay group traded at Fort Connolly, which required travel through the Thutade area. Also, when Black proceeded to Thutade Lake, where he camped for some time, he noted the many campfires of Tsek'ene (Sekani) people around the lake. Black provides clear, written evidence that the Upper Finlay River and Thutade Lake area were traditional homelands of Methodiates and his Tsek'ene (Sekani) followers. Extensive interviewing of Kwadacha Elders over the past 20 years demonstrates consistent belief that the Upper Finlay, Toodoggone, Firesteel, Tatlatui, and Thutade areas were traditionally used by Kwadacha Tsek'ene (Sekani) people previous to Black's journey in 1824.

The Fort Connolly post was established in 1827 at Bear Lake and many of the people trading there were from the upper Finlay area. The primary purpose of the post was apparently to obtain furs from the Tsek'ene (Sekani) peoples.

Research has established that the trail system around and through the Thutade Lake area provided links to coastal peoples with whom the Tsek'ene (Sekani) traded for items such as salt. Another example of this coastal-interior trade is the arrowheads of obsidian found in Rocky Mountain Trench and traced to Mt. Edziza.

Ft. Grahame, also known as Bear Lake Outpost was established in 1875, closed and re-opened, and finally closed in 1949. This post, located down the Finlay River from Kwadacha Tsek'ene (Sekani) people, provided easier access to trading and may have begun a change in travel patterns for the people of the upper Finlay.

The Fort Ware HBC trading post was established in 1920's as "Fort Grahame Outpost." Previous to that, there was no settlement along the Finlay River above Fort Grahame. Extended family groups of Tsek'ene (Sekani) travelled on known trails following seasonal hunting and gathering patterns, and gathering seasonally with other Tsek'ene (Sekani) groups. The nearest posts were Fort Grahame, Fort Connelly (Bear Lake) and McDame's Creek. HBC records show periodic trading at all these posts by Kwadacha ancestors. In the late 19th and early 20th century, up to the 1920's, one particular group was referred to as "Fort Grahame Nomads" or "Old Davie's" band. They travelled throughout the triangle formed by these three posts and beyond, clearly using trails, resource-harvesting areas, and gathering sites within the area.

HBC records indicate that Tsek'ene (Sekani) people travelled quickly and widely. For example, HBC journals from posts along the Liard River much further north record trading with Tsek'ene (Sekani) from the Fort Connelly area.

In 1926, BC's Registered Trapline System came into effect. Kwadacha Elder interviewees credit Aatse Davie, the only community leader who spoke English (as

verified by video interviews with Kwadacha Elders), with ensuring that Kwadacha families were registered in specific trapline areas. Davie seemed to understand the need to provide hunting and trapping areas for his people. He knew that without registering his community families, outside non-Native trappers would establish registered ownership of trapline areas and jeopardize food and income sources for his Tsek'ene (Sekani) people. Previous to that, families gathered seasonally in traditional areas to discuss and organize trapping and hunting, feeling free to make use of all areas within Tsek'ene territory and working together to ensure survival. For example, in the 1935 census list of Fort Ware, the Patrick family (Patrick is generally associated with Bear Lake/Takla) are listed as community members, indicating the interaction and cooperation of Tsek'ene (Sekani) people.

During the 1930's and 1940's, Kwadacha Tsek'ene (Sekani) culture faced traumatic events. First, in the late 1930's, influenza struck in the settlement of Fort Ware. Oral history given by Elders confirms that in one short period 19 community members died. Secondly, in the mid-1940's children began attending Lejac Residential School and were out of community for ten months of the year. These two events caused a break in the oral traditions and generational teaching. Many stories of times past were lost and visiting researchers and/or recording technology were not yet present in the area to assist with community memories.

Current-day Kwadacha was the final Tsek'ene (Sekani) group to be organized as a Band (1940's), the last to have road access and electrical power, and the last to retain geographical isolation. One of the unfortunate results is that much of the stories and oral history of early 20th century Kwadacha Tsek'ene (Sekani) people have been lost.

As wheeled vehicles and boats replaced trails as the main means of transportation, Kwadacha people, geographically the closest settlement to Thutade Lake, turned more frequently to the nearest trading posts – Fort Ware and Fort Grahame. Now, with better roads, more community members return to the Moose Valley / Thutade area to hunt, camp, and harvest.

Local geographic names are directly derived from Tsek'ene (Sekani) language, as verified by Kwadacha Elders:

- Thutade – water above (head waters)
- Tatlatui – where the waters separate
- Toodoggone – dark waters (water runs muddy in springtime)

The Caribou Hide Trail, historically a main transportation link, passes partially through current-day Kwadacha territory, including the Thutade Lake area.

Family links:

- Elder Mary Jean Poole, nee Bob, traces her family to Bear Lake.
- Monroe Massettoe, grandfather of Elder Shirley Massettoe and siblings, considered Thutade Lake area to be his trapping line. He was recognized as coming from Dease Lake and traveled through the Thutade-Tatlatui area to marry one of Aatse Davie's daughters. The Upper Finlay was and still is the Massettoe's traditional hunting/trapping area.
- Aatse Davie is considered by Kwadacha people as their first chief and the one who established the village of Fort Ware. Oral history traces his place of birth to Fort Connelly and his mother a Tsek'ene woman who lived near the settlement.

11.9 Potential Impacts on Aboriginal Title, Rights, and Interests

11.9.1 Assessment Methodology

As described above, the TKN First Nations claim that the Aboriginal title, rights, and interests of the TKN First Nations include the right to use, occupy, and possess the lands, waters, air, and resources in their respective traditional territories as identified in Figure 14 (TKN Territories). In addition, the TKN First Nations claim independent freestanding Aboriginal rights to manage and harvest fish, wildlife, plants, and other species in the TKN Territories for a variety of purposes as described above.
This section provides TKN's assessment of the KUG Project impacts on TKN's ability to use, occupy, and possess the land, waters, air, and resources in the TKN Territories, including by managing and harvesting fish, wildlife, berries, plants, and other resources described above.

A comprehensive assessment of the impacts of the KUG Project on the Aboriginal title, rights, and interests of the TKN First Nations which includes and is based on TKN's perspectives requires a different methodology to that used for the effects assessment in Part B. It requires that the assessment reflect the territorial-basis upon which Aboriginal title and rights exist and are exercised, and be based on a baseline-context of the current abilities of TKN First Nations to meaningfully exercise their Aboriginal title, rights, and interests.

The Eco Report assesses the KUG Project's impacts on the Aboriginal title, rights, and interests of the TKN First Nations from that unique perspective.

The approach used by the authors of the Eco Report included the following methodological steps:

1. The current understanding of the Aboriginal title, rights, and interests of the TKN First Nations (relative to the KUG Project) were described and “framed” to produce a common understanding of associated geographical area(s) and environmental matters that need to be scoped into this assessment.

2. Each of the TKN Territories was then scoped relative to key historical effects that influence the current condition of the environment and the TKN’s ability to exercise the Aboriginal title, rights, and interests of the TKN First Nations. Key environmental trends within each of the TKN Territories were also identified at this stage.

3. Landscape-level indicators were then assessed for each of the TKN Territories to understand the current condition of each Territory relative to land and resource use pressures, and potential sensitivity to additional disturbance.

4. Key biological resources that are central to the Aboriginal title, rights, and interests of the TKN First Nations (as described above) were then assessed in terms of their current health-status.

5. This information was then used to build and inform an understanding of the existing status-health of the Aboriginal title, rights, and interests of the TKN First Nations (i.e. “the ability to meaningfully exercise”).

6. The KUG Project’s impacts and effects that are relevant to the Aboriginal title, rights, and other interests of the TKN First Nations were then summarized based on the information presented in the Application.

7. Based on this information, the associated adverse effects of the KUG Project, and corresponding KUG Project impacts on the Aboriginal title, rights, and other interests of the TKN First Nations, were characterized.

Given that the TKN First Nations have each identified its respective traditional territory (Territory) as set out in Figure 14, and those Territories encompass different geographical areas, there are differences that exist with respect to:

a. The manner in which historical environmental impacts and trends have affected each of the TKN First Nation’s interests;

b. The array (stocks, populations, etc.) of fish and wildlife resources that support the exercise of Aboriginal title, rights, and other interests of the TKN First Nations by each TKN First Nations;
c. The condition or status of those fish and wildlife stocks/populations; and, therefore; and
d. The “background-context or baseline” of the current condition of the “ability to exercise rights” by each of the TKN First Nations.

Given the site-specific nature of the KUG Project and its direct impacts, in addition to considering Nation-level differences in the “background-context or baseline” of the current condition of the “ability to exercise rights”, an analysis at the Nation level also has to consider that:

i. The direct impacts of the KUG Project would interact differently depending on Territory-geography; and
ii. The effects of the KUG Project’s impacts would be of differing consequence (based on Territory-specific baseline condition and interaction).

The Eco Report assessed the entirety of the TKN Territories in an effort to describe the “background-context or baseline” to the current condition of the “ability to exercise rights”, but has segmented findings in a manner that allows resolution at the individual Nation level. For this reason, all areas of the TKN Territories are discussed, regardless of whether there is a potential effect from the KUG Project. The assessment is summarized and characterized below.

11.9.2 Existing State of Affairs; Historical Environmental Effects and Trends

The multitude of post-contact impacts on the Aboriginal title, rights, and interests of the TKN First Nations have been described elsewhere (Project Application Chapter 21, Project Application Appendix 20-A, Brody 1981; L. Littlefield, Dorricott, and Cullon 2007).

Access into the KUG Project area has gradually increased over the years. The first rough road approaching the area was the Omineca road from Fort St. James to Germansen Landing. The road was extended to Aiken Lake from 1959 to 1962. From 1970 to 1971, Falconbridge extended the road to Moose Valley. In 1986, Cheni Mines extended the road from Moose Valley to Sturdee Valley and Lawyers Pass. Access to the KUG Project area was further improved with the opening of the ORAR to the public; the section south of Moose Valley opened in 1986, and the section north of Moose Valley in 1992 (Dewhirst 1995).

Mineral exploration has taken place in the Kemess area since 1889. Actual mining of the KS deposit commenced as an open pit operation in 1998 and continued to 2011. KS was accessed via the ORAR, which was maintained as an all-weather main line road from Mackenzie, providing transportation of mine supplies and concentrate. Since the closure of KS, the ORAR has been maintained during the summer months.

The Eco Report indicates that environmental conditions within the TKN Territories have been heavily influenced by a number of background trends and historical effects, which have had, and continue to have, significant adverse impacts on TKN members' abilities to meaningfully exercise Aboriginal title, rights, and interests of the TKN First Nations.

These include:

- Climate change related trends, including warming air and water temperatures, and shifting precipitation and run-off patterns, which have broadly caused the following environmental effects and adverse impacts to the TKN Territories:

    - large-scale forest health issues;
    - fires and salvage logging;
    - altered stream thermographs/hydrographs;
    - large-scale terrestrial habitat disturbance and alteration, with corresponding effects on wildlife species; and
    - shifting discharge regimes, warming stream temperatures and lower summer flows adversely effecting fish health.

    Climate change also contributes to effects outside of the TKN Territories which have also adversely impacted TKN members' ability to exercise the Aboriginal title, rights, and interests of the TKN First Nations including by reducing marine productivity which has caused a corresponding adverse impact on salmon populations.

- The impoundment and regulation of the Peace River and the creation of the Williston and Dinosaur reservoirs, which has broadly caused environmental effects as well as adverse impacts to the TKN Territories – including:

    - inundated watersheds, including river-bottom habitats that were central to traditional use, including travelling, seasonal occupation, and harvesting and gathering and related cultural practices;
    - shifts in fish fauna and their distribution within the reservoir-affected areas;
    - alienation of lands; and

- fish toxicity effects.

- The diversion, impoundment and regulation of the Nechako River which has adversely affected fish populations.

- The enhancement of sockeye runs returning to Babine Lake (Pinkut and Fulton) and subsequent focused high-exploitation commercial fisheries that intercept non-enhanced stocks at non-sustainable rates.

These environmental effects have resulted in well documented and ongoing adverse effects on aquatic and terrestrial ecosystem health, and on the biological resources that the Territories are capable of supporting, with corresponding impacts on the abilities of members to exercise the Aboriginal title, rights, and interests of the TKN First Nations. These factors serve as "background-context" to the current condition of environmental values and biological indicators within each of the TKN Territories.

TKN view the historical environmental effects and trends, and ongoing land use pressures within the TKN Territories (alienation and alteration of lands, elimination of resources, etc.), as having substantial impacts on the ability of TKN members to undertake their traditional activities. Further, as set out below, the current health or status of the key fish and wildlife species that support the exercise of Aboriginal title, rights, and interests of the TKN First Nations are diminished in many instances, constraining the ability to exercise harvesting rights for several key species.

11.9.2.1 *TKN's Assessment of the Current Status of Fish Populations in the Territories and TKN Members' Ability to Meaningfully Harvest Those Populations*

The Eco Report assessed the status/health of key species of concern to TKN based on available information. The below section provides a summary of each fish stock/population considered within each of the 5 major watersheds captured within the TKN Territories and considered in this assessment, and which supports TKN members' ability to meaningfully harvest those populations. The bolded text under each summary reflects a corresponding assessment of the ability of TKN members to meaningfully exercise their harvesting rights within each of those watersheds (i.e. the baseline of the ability to exercise). That assessment is based on the degree to which the TKN's ability to exercise the right within each of their traditional territories is constrained, according to the following scale:

- Not constrained: ability to exercise is largely intact;

- Moderately constrained: ability to exercise is possible but constrained in some minor-to-moderate manner (e.g. population(s) is below a desired level, access is constrained by range retraction or other factor, harvesting conditions are adversely effected, etc.);
- Highly constrained: access/harvest is not possible in some years, and/or otherwise constrained below the level desired to meet the need; and
- Fully constrained: access/harvest not possible.

Fraser Watershed

- *Salmon (sockeye, chinook and coho)*: **poor status, access highly constrained.**

  (Species are unavailable for harvest in some years and available in other years at levels insufficient to meet TKN needs, due to low returning abundance, restricted allocation and/or conservation closure)

- *Sturgeon*: **access/harvest not possible (fully constrained)**

  (Population is listed under SARA as Endangered; population has suffered a recruitment failure due to the damming, diversion and regulation of the Nechako River)

- *Other resident fish stocks (trout, char, whitefishes, burbot, minnows/chub, suckers, etc.)*: assumed to be healthy but information deficient (Stocks used by TKN but they are generally not actively managed/monitored by the Province)

Conclusion

TKN members' ability to meaningfully exercise fish harvesting rights within the Fraser watershed portion of the Territories is highly constrained.

Skeena Watershed

- *Salmon*:

  - *Sockeye (Bear)*: **chronically underperforming (low escapements) due to over exploitation; highly sought after and used by TKN**
  - *Sockeye (Sustut, Asitka, Johanson)*: **small stocks and data limited; suspected to be declining and underperforming**
  - *Chinook (Bear)*: **declining returning spawner abundance, highly used**
  - *Coho (primarily Bear)*: **returns improving recently, highly used**
  - *Steelhead (Sustut/Bear)*: Bear population not monitored; **returns improving, highly used**

- Resident fish stocks (trout, char, whitefishes, burbot, minnows/chub, suckers, etc.): status is assumed secure due to remoteness of area; information deficient (Stocks are used by TKN but are generally not actively managed/monitored by the Province)

Conclusion

TKN members' ability to exercise fish harvesting rights in the Skeena watershed is not presently constrained, but there is considerable risk to harvesting rights due to external influences (marine exploitation and productivity) and limited monitoring (harvesting beyond sustainable levels).

Peace-Williston Watershed

- *Reservoir affected areas*[33] *(Arctic grayling, bull trout, lake trout, lake white fish, mountain whitefish, rainbow trout, kokanee)*: transition to a reservoir environment has created a number of issues deterring use – **traditional practices have been disrupted and new "reservoir environment" is perceived as dangerous, fish are perceived as being unsafe to eat, and recent studies suggest those perceptions are well founded**.

  New (stocked) species such as kokanee are flourishing.

- *Non-reservoir affected areas*[34] *(Nation Lakes, Germansen Lake, upper Finlay (Firesteel/Thutade), upper Kwadacha)*: Some of these areas are remote/distant, others are accessible and therefore popular and well used, **perception of the risk of contamination and other factors are a deterrent to TKN use.**

- *Lake trout (non-reservoir populations)*: **9 of 28 naturally occurring lake dwelling populations demonstrate overharvest or heightened sensitivity to harvest.**

- *Dolly Varden*: unique to Finlay and Ingenika river headwater drainages. **Kemess/Thutade area population has had contamination issues due to KS and substantial perception of the risk of contamination exists.**

[33] Includes areas directly affected by impoundment, including inundation and habitat and fishing site alienation/alteration, and fish faunal shifts, and MeHg contamination.
[34] Peripheral areas of the watershed that are upstream of fish migration barriers and therefore not subjected to the direct effects of impoundment and inundation.

Conclusion

TKN members' ability to exercise fish harvesting rights in the Peace-Williston watershed is highly constrained.

Peace-Eastern Slopes Watersheds

- *Remote headwaters of Halfway/Graham rivers*: non-reservoir affected at present (rivers drain into the portion of the Peace River that will become future Site C reservoir). Portion in the TKN Territories is largely upstream of barriers, so contains largely isolated populations of fish. The fish values are assumed to be of high value and of healthy status but there is no monitoring information to support this assumption.

Conclusion

TKN members' ability to exercise fish harvesting rights in the Peace-Eastern slope drainages is not constrained.

Upper Stikine (Upper Stikine, Spatsizi, Chukachida)

- Important traditional use area with substantial ecotourism. Very limited inventory information available and no monitoring information that would inform a status assessment. Largely within protected areas and fish values suspected to be healthy.

Conclusion

TKN members' ability to exercise fish harvesting rights in the upper Stikine watershed is not constrained.

Liard (Kechika/Gataga, Muskwa/Tuchodi, Wokkpash)

- Important traditional use area with substantial ecotourism. Very limited inventory information available. Largely within protected areas and parks and fish values suspected to be healthy due to remoteness. Issues identified with recent increased access and use by BC residents via increased fly-in and jet boat access and concerns over localized harvest and disturbance in more easily accessed areas.

Conclusion

TKN members' ability to exercise fish harvesting rights in the Liard watershed portion of TKN Territories is not constrained.

11.9.2.2 *Assessment of the current status of wildlife populations in the Territories and TKN members' ability to meaningfully harvest those populations*

The Eco Report reaches the following conclusions about the status of wildlife resources that support TKN's rights to manage and use those resources in the TKN Territories (the bolded text under each summary reflects a corresponding assessment of the ability of TKN members to meaningfully exercise wildlife harvesting rights). The below section provides a summary of the current status of wildlife populations within the TKN Territories, and findings in relation to their status.

Caribou

- There are 12 recognized caribou populations within the TKN Territories.
- There is insufficient information to assess the health of the northern most populations (Spatsizi, Rabbit, Muskwa, Gataga, Pink Mountain and Frog). They are generally located in remote, undeveloped areas.
- Six populations within the TKN Territories (Finlay, Graham, Chase, Wolverine, Takla, and Scott) are recognized to be in declines of varying severity. The Finlay, Chase, Wolverine, Graham and Takla subpopulations have declined and are expected to continue to decline. The *Scott subpopulation has been extirpated* from much if its range, and *is designated as Endangered*.

Conclusion

TKN members' ability to exercise caribou harvesting rights is constrained by declining abundance and range contraction. Declines are likely to continue and worsen. In particular, TKN members' ability to exercise caribou harvesting rights**:**

a. *is moderately constrained* for the six most northern subpopulations within the Territories; and
b. *is highly constrained* for the six southern subpopulations within the Territories.

Moose

- Limited contiguous survey-monitoring information is available for moose within the majority of the TKN Territories. Where information is available, it does not suggest a broad scale decline within the TKN Territories, but there are localized areas that appear to have experienced declines.

Conclusion

TKN members' ability to exercise moose harvesting rights is moderately constrained by what are assumed to be localized effects on abundance due to concentrated effort and harvest in areas where moose habitat and access coincide.

Mountain Goat and Stone's Sheep

- Information in relation to these species is generally deficient. The Province considers the status of these species within the TKN Territories to be stable (based on available hunter harvest and effort data, and some population survey data). However, TKN have noted range retractions for both species over time associated with reservoir and industrial development (largely road access), forestry and mining, and licensed hunting pressure.

Conclusion

TKN members' ability to exercise mountain goat and Stone's sheep harvesting rights is constrained based on historical effects.

Grizzly Bear

- Populations within the TKN Territories are recognized as viable, but the Eco Report concludes that disturbance indicators related to development pressures are likely adversely affecting the two primary populations within the area.

Conclusion

TKN members' ability to exercise grizzly bear harvesting rights is not constrained.

Hoary Marmot

- The Provincial status is considered secure; however there is inadequate inventory and monitoring information to assess the health of this species within the TKN Territories.

Conclusion

At present, it is assumed that TKN members' ability to exercise harvesting rights in relation to Hoary Marmot is not constrained.

11.9.2.3 *Summary; Baseline-Context (Historical Environmental Effects/Trends and Population Health-Statuses)*

The information from the Eco Report presented in section 11.9.2 documents that

background trends and historical effects on environmental values within TKN Territories have had, and continue to have, significant adverse impacts on TKN's abilities to meaningfully exercise the Aboriginal title, rights, and interests of the TKN First Nations. These impacts include climate change related trends, the impoundment and regulation of the Peace River and the creation of the Williston and Dinosaur Reservoirs, and the diversion, impoundment and regulation of the Nechako River, forestry and mining and related road development and disturbance, and other land and resource management regimes. These matters have resulted in well documented and ongoing adverse effects on aquatic and terrestrial ecosystem health, and on the biological resources that TKN Territories are capable of supporting.

The results of these effects are reflected in the status or health of many of the fish and wildlife populations that occur within the TKN Territories and support the exercise of harvesting rights and related cultural practices.

The prior/ongoing impacts/trends and their effects, and the current status of fish and wildlife provide a "background-context or baseline" of the current condition of the "ability to exercise rights", and serve as a means through the KUG Project's impacts should be assessed for the purposes of characterizing their potential effects on the Aboriginal title, rights, and interests of the TKN First Nations.

11.9.3 TKN's Summary of the KUG Project's impacts on Aboriginal title, rights, and interests of the TKN First Nations associated with using, occupying, and possessing the land, waters, air, and resources in the TKN Territories

Important means by which the KUG Project would potentially interact with the TKN Territories and impact Aboriginal title, rights, and interests of the TKN First Nations associated with the land, waters, air, and resources in the TKN Territories include the following:

1. *Biophysical impacts on wildlife*: The KUG Project is predicted to have localized impacts on wildlife behaviour, including movement patterns and habitat use, and direct effects on terrestrial/wildlife habitats. It is also predicted that the KUG Project would result in the mortality of hoary marmots and destruction of their habitats. TKN management and use of the land, and harvesting and associated cultural practices within the KUG Project area would be precluded by the access restrictions associated with the KUG Project. The KUG Project area would adversely affect moose, caribou, grizzly and hoary marmots through habitat alteration and disruption, and the TKN's abilities to exercise their harvesting rights for those species would also be adversely affected.

Proposed Conditions: EAO and TKN have proposed the following conditions to mitigate adverse effects on wildlife:

- Wildlife Management and Monitoring Plan which would address effects to wildlife, alpine species, birds, bats, caribou and effects along the ORAR; and
- Caribou Program which would require AuRico to enter into an agreement with FLNRO regarding AuRico's participation in a program of activities that supports the conservation and management of caribou in the KUG Project area.

2. *Biophysical impacts on fish*: Aquatic values are anticipated to (continue to) be adversely affected by waste rock and tailings management, and related seepage, wastewater and effluent management. These issues would result in adverse effects to water quality and quantity that would adversely affect fish and their habitat within the receiving environment. Fishing areas within the access restricted zone would be unavailable for use. TKN-use in areas downstream of the access restricted zone would be affected by the perception of the risk of contamination. Adverse effects on fish and fish habitat within streams/lakes receiving mine effluent and seepage/wastewater are cumulative to adverse effects on watershed health and dolly varden/bull trout relating to KS, and may eliminate additional harvesting opportunities.

   Proposed Conditions: EAO and TKN have proposed the following conditions to mitigate adverse effects to fish and aquatic habitat:

   - Fish and Aquatic Effects Monitoring Plan to monitor concentrations of bio-accumulative contaminants in bull trout in Thutade Lake.
   - Se concentrations of the discharge to Waste Rock Creek from the TSF during post-closure will not incrementally affect Se concentrations in Waste Rock Creek.
   - Requirement for AuRico to engage with TKN on the design of the diffuser to show how it minimized the length of the IDZ, and implement mitigation measures for any observed adverse effects of the IDZ on fish habitat use.
   - Staged discharge from the KUG Project TSF to Attichika Creek to a volume proportional to the Attichika Creek monthly streamflow and restricted to the open water months.
   - Treatment of the effluent from the KUG Project TSF for metals and Se to meet WQG or SBEB.
   - Construction EMP, which would include requirements for sediment and erosion control measures to protect aquatic habitat.

3. *Additional disturbed areas*: The mine site and ore/wastewater transport corridor would impact the ecology of the lands and waters in the Territories, and alienate lands from TKN's use. The "disturbed area" includes the disturbed and operational areas of the mine, and a buffer.

4. *Restricted access to a large area in TKN Territories*: The total amount of land that would be restricted from TKN access and use as a result of the access restrictions implemented in relation to the KUG Project and KS would be approximately 8,538 ha.

5. *Occupation of TKN Territories*: Additional lands within the TKN Territories that would be occupied for industrial purposes (the KUG Project) by non-TKN entities (increased area of lands alienated from traditional uses or other TKN objectives).

6. *Delayed reclamation and restoration of KS lands*: The continued use of areas previously disturbed for KS that would delay their reclamation.

7. *Contamination of water*: Additional (to KS) contaminated wastewater, seepage and TSF effluent that directly affect aquatic and terrestrial values and also poses addition environmental risk, predicted to result in:

    a. Altered water quality and hydrology in downstream areas; and
    b. Further deterrence to traditional use through TKN members' perception of risk of contamination relating to effluent and toxicity (environmental health) effects.

    Proposed Conditions: EAO and TKN have proposed the following conditions to mitigate adverse effects to water quality and to address the perception of risk of contamination:

    - Amazay Lake surface water quality monitoring and groundwater monitoring to detect groundwater movement from the underground cave/subsidence zone towards Amazay Lake.
    - Treatment of the effluent from the KUG Project TSF for metals and Se to meet WQG or SBEB.
    - Se concentrations of the discharge to Waste Rock Creek from the TSF during closure do not incrementally affect Se concentrations in Waste Rock Creek.
    - Establishment of an Environmental Monitoring Committee to provide a forum for information sharing, and discussion of topics of interest to TKN including water management and water quality monitoring to ensure that TKN and relevant government agencies

are involved in the ongoing development of the mine, mitigation and monitoring measures and adaptive management.

8. *Increases in industrial traffic, noise, dust, etc*.

    a. Deterring traditional use due to access restrictions in the Restricted Area and potentially through alterations in the environmental setting within a broader area.

9. *Increased access to TKN Territories by non-TKN members*: Improved/maintained access corridors into the TKN Territories.

    a. Potentially facilitating increasing numbers of resident hunters and anglers accessing the TKN Territories in the vicinity of the KUG Project because of well-maintained access, increasing competition for resources and increasing harvest of resources. Both would adversely impact the ability of TKN members to exercise the Aboriginal title, rights, and interests of the TKN First Nations.

10. *Increased risk to the TKN Territories and Aboriginal title, rights, and interests of the TKN First Nations:* Potential accidents and malfunctions arising from the construction and operation of the KUG Project, including as a result of a breach of the KUG Project TSF, would introduce a significant risk of damage being caused to the TKN Territories and the Aboriginal title, rights, and interests of the TKN First Nations.

    Proposed Conditions: EAO and TKN have proposed the following conditions to address effects from accidents and malfunctions:

    - Accidents and Malfunctions Communication Plan to address how TKN, communities and other users of the area potentially affected by an accident or malfunction would be notified in the event of an accident (e.g., tailings breach), the remedial action being taken by AuRico and subsequent monitoring.
    - Accidents and Malfunctions Administration Plan to ensure that AuRico has a plan to address accidents identified as low environmental risk in the Application and manage and monitor accidents along the ORAR including fires.
    - Establishment of an Environmental Monitoring Committee to provide a forum for information sharing, and discussion of topics of interest to TKN including KUG Project TSF design considerations, operations and

monitoring to ensure that TKN and relevant government agencies are involved in the ongoing development of the mine, mitigation and monitoring measures and adaptive management.

- Feasibility Study for the tailings beach to assess the feasibility of increasing the tailings beach width to maximize the safety of the KUG Project TSF dam.

11. The KUG Project would incrementally contribute to factors that have already resulted in the diminished status of key species and / or other factors impacting the abilities of TKN members to exercise the Aboriginal title, rights, and Interests of the TKN First Nations.

11.9.4 TKN's Assessment of KUG Project Impacts to the Aboriginal Title, Rights, and Interests of the TKN First Nations

The following summarizes the KUG Project's impacts to Aboriginal title, rights, and interests of the TKN First Nations, including information relating to the status/population trends for fish and wildlife species assessed, how that information relates to the Aboriginal title, rights, and interests of the TKN First Nations, and how the KUG Project's impacts are anticipated to affect the Aboriginal title, rights, and interests of the TKN First Nations. The KUG Project effects are categorized relative to the following characterizations:

Table 43: Characterization of KUG Project Effects on the Aboriginal Title, Rights, and Interests of the TKN First Nations

Rank	Characterization
0	Negligible impact – no detectable impact or any change from current conditions;
1	Negligible-to-minor – some detectable impacts or change from current condition;
2	Minor impact – ability to exercise the right is minimally disrupted;
3	Minor-to-moderate – ability to exercise the right is more than minimally disrupted;
4	Moderate impact – ability to exercise the right has been diminished or disrupted;
5	Moderate-to-serious – ability to exercise the right has been more than moderately diminished; and
6	Serious impact – ability to exercise the right has been significantly diminished.

11.9.4.1 *Takla Lake First Nation (Aquatic-Fish)*

TLFN Territory encompasses portions of the Fraser, Skeena, and Peace Williston Watersheds. Based on baseline information developed, the Eco Report found that the ability of TLFN to exercise fish harvesting rights is **highly constrained:**

1. Fraser Summary: TLFN's ability to exercise fish harvesting rights within the Fraser portion of the TKN Territories is **highly constrained**.
2. Skeena Summary: TLFN's ability to exercise fish harvesting rights in the Skeena is **not presently constrained**, but there is **considerable risk to harvesting rights due to external influences** (marine exploitation and productivity) **and limited monitoring** (potential for harvesting beyond sustainable levels).
3. Peace-Williston Summary: TLFN's ability to exercise fish harvesting rights in the Peace-Williston is **highly constrained** due to the large-scale habitat alterations that occurred as a result of reservoir creation, and related direct effects on traditional use sites, fish faunal transition, and toxicity issues (real and perceived).

The KUG Project is located in the Peace-Williston watershed and has been assessed as having the following impacts on aquatic values and TLFN's interests in aquatic values:

a. The KUG Project would incrementally contribute to factors that have already resulted in the diminished status of key species and / or other factors impacting the abilities of TLFN members to exercise their Aboriginal title, rights, and interests;
b. 8,538 ha of TLFN Territory would be unavailable for use;
c. Additional lands within TLFN Territory would be occupied for industrial purposes by non-TLFN entities, and altered/alienated in ways that may make them unsuited to TLFN's preferred uses or objectives for the long-term;
d. Adverse effects on fish and fish habitat within streams/lakes receiving mine effluent and seepage/wastewater are cumulative to adverse effects on watershed health and dolly varden/bull trout relating to KS, and may eliminate additional harvesting opportunities;
e. Well-maintained access (ORAR - transects the Peace Williston and Skeena watersheds) would result in increasing competition for resources with licenced anglers and increasing harvest of resources;
f. Further deterrence of traditional use in the area through the perception of risk of contamination; and,
g. Further deterrence of traditional use in the area through changes in the environmental setting.

The KUG Project impacts would worsen TLFN's already highly constrained ability to exercise fish harvesting rights and other aquatic interests. As such, the anticipated KUG

Project impacts on TLFN are:

- Peace-Williston: **Negative (Serious)** due to highly constrained baseline and direct impacts in TLFN Territory; and
- Skeena: **Negligible** in the Skeena (assuming adequate baseline).

11.9.4.2 *Takla Lake First Nation (Wildlife)*

Caribou

Four of the five populations that occur in TLFN Territory are recognized to be in decline, and the trend is described as not clearly reversible. The Chase, Wolverine and Takla populations are SARA-listed "**Threatened**" (2003). The Scott population is **Endangered** (COSEWIC 2014), and is extirpated from a portion of TLFN Territory. Causative factors include habitat disturbance and predation. TLFN's ability to exercise caribou harvesting rights is **highly constrained** and likely worsening (due to continued population declines for 4 populations).

The KUG Project area is not encompassed within the recognized core range of any recognized population, but caribou presence is common in the KUG Project area. Recent studies of the "southern zone of trace occurrence" (which encompasses the KUG Project) have resulted in a recommendation to designate a new/proposed population (Thutade herd), the core range of which would encompass the KUG Project footprint.

The KUG Project has been assessed as having the following impacts on caribou and TLFN's interests in caribou:

a. The KUG Project would incrementally contribute to factors that have already resulted in the diminished status of key species and / or other factors impacting the abilities of TLFN members to exercise their Aboriginal title, rights, and interests;
b. The KUG Project would adversely affect caribou through habitat alteration and disruption, and these affects will be incremental to other factors in the region that are contributing to declining caribou populations;
c. 8,538 ha of TLFN Territory would be unavailable for use, including hunting;
d. Additional lands within the TLFN Territory would be occupied for industrial purposes by non-TLFN entities, and altered/alienated in ways that may make them unsuited to TLFN's preferred uses or objectives (including caribou) for the long-term;
e. Well-maintained access would result in increasing competition for resources with licenced hunters and increasing harvest of resources;

f. Further deterrence of traditional use in the area through perception risk; and
g. Further deterrence of traditional use in the area through changes in the environmental setting.

Given the importance of caribou to TLFN's Aboriginal title, rights, and interests, and the highly constrained and worsening baseline, the anticipated KUG Project impacts on TLFN's interests in caribou are **Negative (Serious).**

Moose

Contiguous survey-monitoring data for moose in the TLFN Territory is lacking. Available information does not suggest broad scale declines, but there are localized areas that appear to have experienced declines. Likely causative factors for localized declines noted include focussed hunting/harvesting in areas where motorized access and moose habitat coincide. The ability of TLFN to exercise their moose harvesting rights is **moderately constrained.**

The KUG Project has been assessed as having the following impacts on moose and TLFN's interests in moose:

a. The KUG Project would incrementally contribute to factors that have already resulted in the diminished status of moose and / or other factors impacting the abilities of TLFN members to exercise their Aboriginal title, rights, and interests;
b. The KUG Project would adversely affect moose through habitat alteration and disruption;
c. 8,538 ha of TLFN Territory would be unavailable for use, including hunting;
d. Additional lands within TLFN Territory would be occupied for industrial purposes by non-TLFN entities, and altered/alienated in ways that may make them unsuited to TLFN's preferred uses or objectives (including moose) for the long-term;
e. Well-maintained access would result in increasing competition for resources with licenced hunters and increasing harvest of resources;
f. Further deterrence of traditional use in the area through perception of risk of contamination; and
g. Further deterrence of traditional use in the area through changes in the environmental setting.

Based on the poor state of TLFN's ability to exercise moose harvesting rights, the importance of moose, concerns regarding localized hunting pressure and concentrated harvest, and the ORAR's role in facilitating licenced hunter access, the anticipated KUG Project's impacts on TLFN's interests in moose is **negative (moderate)**.

Mountain goat and Stone's sheep

Monitoring/survey information is generally deficient for both species. The Provincial perspective on these species' status within the TLFN Territory is that they are stable, based on available hunter harvest and effort data, and some population survey data. TLFN have noted range retractions for these species over time associated with reservoir development and industrial development (largely road access) and licenced hunting pressure. TLFN's ability to exercise harvesting Rights is **"moderately constrained",** based on historical effects.

The KUG Project area is not coincident with Mountain goat and Stone's sheep habitat/range. The ORAR has and would continue to facilitate licenced hunter access to goat and sheep range, resulting in increased hunting and harvest. Anticipated KUG Project impacts on TLFN's interests in goat and Stone's sheep is **negative (Minor).**

Grizzly

The four GPBU's within TLFN Territory (Upper Skeena-Nass, Finley-Ospika, Omineca, Nation), are categorized as "viable". While there is a lack of population trend data, terrestrial disturbance indicators (see Section 5.1 of the Eco Report) suggest that the two southern-most GBPU's (Omineca and Nation) are likely adversely affected by development pressures. TLFN's ability to exercise harvesting rights related to grizzly bear are presently **not constrained**, but are expected to worsen.

The KUG Project area is located within the Finlay-Ospika GBPU. KUG Project impacts on grizzly and TLFN's interests in grizzly include:

a. The KUG Project would incrementally contribute to factors that have already resulted in the diminished status of grizzly and / or other factors impacting the abilities of TLFN members to exercise their Aboriginal title, rights, and interests;
b. The KUG Project would adversely affect grizzly through habitat alteration and disruption, and conflicts and mortalities;
c. 8,538 ha of TLFN Territory would be unavailable for use, including hunting;
d. Additional lands within the Territories would be occupied for industrial purposes by non-TLFN entities, and altered/alienated in ways that may make them unsuited to TLFN's preferred uses or objectives (including grizzly) for the long-term;
e. Well-maintained access would result in increasing competition for resources with licenced hunters and increasing harvest of resources;
f. Further deterrence of traditional use in the area through perception of risk of contamination; and,
g. Further deterrence of traditional use in the area through changes in the environmental setting.

The anticipated KUG Project impacts on TLFN's interests in grizzly are **negative (Negligible to Minor)**, assuming the baseline is not constrained.

Hoary marmot

The provincial status of hoary marmot is considered **secure**. Within TLFN Territory there is an absence of inventory and/or monitoring information. TLFN's ability to exercise harvesting rights is assumed to be **not constrained**.

The KUG Project is predicted to result in the mortality of hoary marmots and destruction of their habitat within specific areas within the KUG Project's footprint.

The anticipated KUG Project impacts on TLFN's interests in marmot are **negative (Negligible to Minor)**, assuming baseline of the ability to exercise is unconstrained.

11.9.4.3 *TKD Nation (Aquatic-Fish)*

TKD Territory encompasses three major watersheds (Skeena, Peace-Williston, Peace-Eastern Slopes), Based on baseline information developed, the Eco Report found that the ability of TKD to exercise fish harvesting rights is **highly constrained:**

- Skeena Summary: TKD's ability to exercise fish harvesting rights in the Skeena is **not presently constrained**, but there is **considerable risk to harvesting rights** due to external influences (marine exploitation and productivity) and **limited monitoring** (potential for harvesting beyond sustainable levels).
- Peace-Williston Summary: TKD's ability to exercise fish harvesting rights in the Peace-Williston is **highly constrained** due to the large-scale habitat alterations that occurred as a result of reservoir creation, and related direct effects on traditional use sites, fish faunal transition, and toxicity issues (real and perceived).
- Peace-Eastern Slopes: **Assumed not presently constrained.** Remote headwaters of Halfway/Graham rivers, fish values assumed to be of high value/healthy status.

The KUG Project is located in the Peace-Williston watershed and has been assessed as having the following impacts on the aquatic values and TKD's interests in aquatic values:

a. The KUG Project would incrementally contribute to factors that have already resulted in the diminished status of key species and / or other factors impacting

the abilities of TKD members to exercise their Aboriginal title, rights, and interests;
b. 8,538 ha of TKD Territory would be unavailable for use;
c. Additional lands within the TKD Territory would be occupied for industrial purposes by non-TKD entities, and altered/alienated in ways that may make them unsuited to TKD's preferred uses or objectives for the long-term;
d. Adverse effects on fish and fish habitat within streams/lakes receiving mine effluent and seepage/wastewater are cumulative to adverse effects on watershed health and dolly varden/bull trout relating to KS, and may eliminate additional harvesting opportunities
e. Well-maintained access (ORAR - transects the Peace Williston and Skeena watersheds) would result in increasing competition for resources with licenced anglers and increasing harvest of resources;
f. Further deterrence of traditional use in the area through perception of risk of contamination; and,
g. Further deterrence of traditional use in the area through changes in the environmental setting.

KUG Project impacts would worsen TKD's already highly constrained ability to exercise fish harvesting rights and other aquatic interests. As such, the anticipated KUG Project impacts on TKD are:

- Peace-Williston: **Negative (Serious)** due to highly constrained baseline and direct impacts in TKD Territory
- Skeena: **Negligible** in the Skeena (assuming adequate baseline).

11.9.4.4 *TKD Nation (Wildlife)*

Caribou

Four of six populations in TKD Territory are recognized to be in decline, and the trend is not clearly reversible. The Graham, Chase, Wolverine populations are SARA-listed Threatened (2003). The Scott population is **Endangered** (COSEWIC 2014) and is extirpated from a portion of TKD Territory. TKD's ability to exercise caribou harvesting Rights is **highly constrained** and likely worsening (due to continued population decline of 4 populations).

The KUG Project area is not encompassed within the recognized core range of any recognized population, but caribou presence is common in the KUG Project area. Recent studies of the "southern zone of trace occurrence" (which encompasses the KUG Project) have resulted in a recommendation to designate a new/proposed

population (Thutade herd), the core range of which would encompass the KUG Project footprint.

The KUG Project has been assessed as having the following impacts on caribou and TKD's interests in caribou:

a. The KUG Project would incrementally contribute to factors that have already resulted in the diminished status of key species and / or other factors impacting the abilities of TKD members to exercise their Aboriginal title, rights, and interests;
b. The KUG Project would adversely affect caribou through habitat alteration and disruption, and these affects will be incremental to other factors in the region that are contributing to declining caribou populations;
c. 8,538 ha of TKD Territory would be unavailable for use, including hunting;
d. Additional lands within the TKD Territory would be occupied for industrial purposes by non-TKD entities, and altered/alienated in ways that may make them unsuited to TKD's preferred uses or objectives (including caribou) for the long-term;
e. Well-maintained access would result in increasing competition for resources with licenced hunters and increasing harvest of resources;
f. Further deterrence of traditional use in the area through perception of risk of contamination; and,
g. Further deterrence of traditional use in the area through changes in the environmental setting.

Given the importance of caribou to TKD's title, rights and interests, and the highly constrained and worsening baseline, the anticipated KUG Project impacts on TKD is **Negative (Serious).**

<u>Moose</u>

Contiguous survey-monitoring data for moose in the TKD area is lacking. Available information does not suggest broad scale declines, but there are localized areas that appear to have experienced declines. Likely causative factors for localized declines noted include focussed hunting/harvesting in areas where motorized access and moose habitat coincide. The ability of TKD to exercise their moose harvesting rights is **moderately constrained.**

The KUG Project has been assessed as having the following impacts on moose and TKD's interests in moose:

a. The KUG Project would incrementally contribute to factors that have already resulted in the diminished status of key species and / or other factors impacting the abilities of TKD members to exercise their Aboriginal title, rights, and interests;
b. The KUG Project would adversely affect moose through habitat alteration and disruption;
c. 8,538 ha of TKD Territory would be unavailable for use, including hunting;
d. Additional lands within TKD Territory would be occupied for industrial purposes by non-TKD entities, and altered/alienated in ways that may make them unsuited to TKD's preferred uses or objectives (including moose) for the long-term;
e. Well-maintained access would result in increasing competition for resources with licenced hunters and increasing harvest of resources;
f. Further deterrence of traditional use in the area through perception of risk of contamination; and,
g. Further deterrence of traditional use in the area through changes in the environmental setting.

Based on the poor state of TKD's ability to exercise moose harvesting rights, the importance of moose, concerns regarding localized hunting pressure and concentrated harvest, and the ORAR's role in facilitating licenced hunter access, the anticipated KUG Project's impacts on TKD's interests in moose is **negative (moderate)**.

Mountain goat and Stone's sheep

Monitoring/survey information is generally deficient for both species. Provincial perspectives on these species' status within TKD Territory is stable, based on available hunter harvest and effort data, and some population survey data. TKD have noted range retractions for these species over time associated with reservoir development and industrial development (largely road access) and licenced hunting pressure. TKD's ability to exercise harvesting rights is **"moderately constrained",** based on historical effects.

The KUG Project area is not coincident with Mountain goat and Stone's sheep habitat/range. The ORAR has and would continue to facilitate licenced hunter access to goat and sheep range, resulting in increased hunting and harvest. Anticipated KUG Project impacts on TKD's interests in goat and Stone's sheep is **negative (Minor).**

Grizzly

The four GPBU's within TKD Territory (Upper Skeena-Nass, Rocky, Finley-Ospika, Omineca), are categorized as "viable". While there is a lack of population trend data, terrestrial disturbance indicators (see Section 5.1 of the EcoReport) suggest that the southern-most GPBU, Omineca, is likely adversely affected by development pressures.

TKD's ability to exercise harvesting rights is presently **not constrained**, but is expected to worsen.

The KUG Project area is located within the Finlay-Ospika GBPU. The KUG Project impacts on grizzly and TKD's interest in grizzly include:

a. The KUG Project would incrementally contribute to factors that have already resulted in the diminished status of key species and / or other factors impacting the abilities of TKD members to exercise their Aboriginal title, rights, and interests;
b. The KUG Project would adversely affect grizzly through habitat alteration and disruption, and conflicts and mortalities;
c. 8,538 ha of TKD Territory would be unavailable for use, including hunting;
d. Additional lands within the TKD Territory would be occupied for industrial purposes by non-TKD entities, and altered/alienated in ways that may make them unsuited to TKD's preferred uses or objectives (including grizzly) for the long-term;
e. Well-maintained access would result in increasing competition for resources with licenced hunters and increasing harvest of resources;
f. Further deterrence of traditional use in the area through perception of risk of contamination; and,
g. Further deterrence of traditional use in the area through changes in the environmental setting.

The anticipated KUG Project impacts on TKD's interests in grizzly are **negative (Negligible to Minor)**, assuming the baseline is not constrained.

<u>Hoary marmot</u>

The provincial status of hoary marmot is considered **secure**. Within the TKD Territory there is an absence of inventory and/or monitoring information. TKD's ability to exercise harvesting rights is assumed to be **not constrained**.

The KUG Project is predicted to result in the mortality of hoary marmots and destruction of their habitat within specific areas within the KUG Project's footprint. The anticipated KUG Project impacts on TKD's interests in marmot are **negative (Negligible to Minor)**, assuming baseline of the ability to exercise is unconstrained.

11.9.4.5 *Kwadacha Nation (Aquatic-Fish)*

KwN Territory occurs in the Peace-Williston, Upper Stikine and Liard watersheds. While the KwN ability to exercise fish harvesting rights in the Peace Williston is negatively impacted by reservoir effects, the northern portion of KwN Territory is largely undeveloped (and the ability to exercise fish harvesting rights within the majority of the KwN Territory are assumed to be unconstrained). Based on baseline information developed, the Eco Report found that the ability of KwN to exercise fish harvesting rights is **moderately constrained**:

- Peace-Williston Summary: KwN's ability to exercise fish harvesting rights in the Peace-Williston is **highly constrained** due to the large-scale habitat alterations that occurred as a result of reservoir creation, and related direct effects on traditional use sites, fish faunal transition, and toxicity issues (real and perceived);
- Upper Stikine: **Not constrained.** Important traditional use area, fish values suspected to be healthy.
- Liard: **Not constrained.** Important traditional use area, fish values suspected to be healthy.

The KUG Project impacts in KwN Territory are related to downstream risk to the aquatic environment. The KUG Project is located in the Peace-Williston watershed (outside of KwN Territory) and has been assessed as having the following impacts on the aquatic values and KwN's interests in aquatic values:

a. The manifestation of the risks the KUG Project poses to the downstream environments would be cumulative with permanent large-scale habitat alterations within the Peace-Williston watershed, which have caused, and continue to cause, highly significant adverse impacts on the ability of KwN's members to exercise their Aboriginal title, rights, and interests;
b. Well-maintained access (ORAR) would result in increasing competition for resources with licenced anglers and increased harvesting of resources;
c. Further deterrence of traditional use in the area through perception of risk of contamination; and
d. Further deterrence of traditional use in the area through changes in the environmental setting.

As such, anticipated KUG Project impacts on KwN's interests in fish are:

- Peace-Williston: **negative (moderate)** due to highly impacted baseline; lack of direct effect within KwN Territory, downstream risks posed, access facilitated.
- Upper Stikine: **negligible** (assuming adequate baseline); potential increase in access, lack of direct effect within KwN Territory.

11.9.4.6 *Kwadacha Nation (Wildlife)*

Caribou

The seven recognized caribou populations in KwN Territory are SARA-listed “Special Concern”. The Finlay population (last estimated at 19 animals) is the most accessible population to KwN and has experienced steep decline (89% between 1994 and 2002), and is currently in decline. The population trend for the other six populations are unknown. KwN’s ability to exercise caribou harvesting rights is considered **moderately constrained** given available information.

The KUG Project has been assessed as having the following impacts on caribou and KwN’s interests in caribou:

a. The KUG Project (which is outside of but adjacent to KwN Territory) would adversely affect caribou through habitat alteration and disruption, and these affects would be incremental to other factors in the region that are contributing to declining caribou populations;
    i. Any KUG Project effects that extend to caribou within KwN Territory would be cumulative with other factors influencing caribou.
b. Well-maintained access would result in increasing competition for resources with licenced hunters and increasing harvest of resources;
c. Further deterrence of traditional use in the area through perception of risk of contamination; and
d. Further deterrence of traditional use in the area through changes in the environmental setting.

The anticipated KUG Project impacts on KwN’s interests in caribou is **Negative (Minor to Moderate)** given the importance of caribou, moderately constrained baseline (considering most accessible Finlay population is in severe decline), and indirect KUG Project impacts.

Moose

Contiguous survey-monitoring data for moose in the KwN area is lacking. Available information does not suggest broad scale declines, but there are localized areas that appear to have experienced declines. Likely causative factors for localized declines noted include focussed hunting/harvesting in areas where motorized access and moose habitat coincide, and increased predation. The ability of KwN to exercise their moose harvesting rights is **moderately constrained.**

The KUG Project has been assessed as having the following impacts on moose and KwN's interests in moose:

a. The KUG Project (which is outside of but adjacent to KwN Territory) would adversely affect moose through habitat alteration and disruption;
    i. Any KUG Project effects that extend to moose within KwN Territory would be cumulative with other factors influencing moose availability and harvesting.
b. Well-maintained access would result in increasing competition for resources with licenced hunters and increasing harvest of resources;
c. Further deterrence of traditional use in the area through perception of risk of contamination; and,
d. Further deterrence of traditional use in the area through changes in the environmental setting.

Based on the impacted state of KwN's ability to exercise moose harvesting rights, the importance of moose, concerns regarding localized hunting pressure and concentrated harvest, and the ORAR's role in facilitating licenced hunter access, the anticipated KUG Project's impacts on KwN's interests in moose is **negative (Minor to Moderate)**.

Mountain Goat and Stone's Sheep

Monitoring/survey information is generally deficient for both species for KwN Territory. Provincial perspectives on these species' status within KwN Territory is stable, based on available hunter harvest and effort data, and some population survey data. KwN have noted range retractions for these species over time associated with reservoir development and industrial development (largely road access) and licenced hunting pressure. KwN's ability to exercise harvesting rights is **"Moderate-Low Constrained",** based on historical effects.

The KUG Project area is not coincident with Mountain goat and Stone's sheep habitat/range or KwN Territory. The ORAR has and would continue to facilitate licenced hunter access to goat and sheep range, resulting in increased hunting and harvest. Anticipated KUG Project impacts on KwN's interests in goat and Stone's sheep is **negative (Minor).**

Grizzly Bear

The five GPBU's within KwN Territory (Spatsizi, Upper Skeena-Nass, Muskwa, Rocky and Finley-Ospika), are categorized as "viable". KwN's ability to exercise harvesting rights related to grizzly are presently **not constrained**.

The KUG Project area is located within the Finlay-Ospika GBPU. Anticipated KUG Project impacts on grizzly and KwN's interests in grizzly include:

a. The KUG Project would adversely affect grizzly through habitat alteration and disruption, and conflicts and mortalities;
b. The KUG Project's effects occur within/are cumulative with large-scale habitat alterations within the Peace-Williston watershed, which have caused, and continue to cause, highly significant adverse impacts on the ability of KwN's members to exercise their Aboriginal title, rights, and interests;
c. Well-maintained access would result in increasing competition for resources with licenced hunters and increasing harvest of resources;
d. Further deterrence of traditional use in the area through perception of risk of contamination; and
e. Further deterrence of traditional use in the area through changes in the environmental setting.

The anticipated KUG Project impacts on KwN's interests in grizzly are **negative (Negligible to Minor)**, assuming the baseline is not constrained.

Hoary marmot

The provincial status is considered **secure**. Within KwN area there is an absence of inventory and/or monitoring information. KwN's ability to exercise harvesting right is **not constrained**.

The KUG Project's impacts on hoary marmot are **not anticipated to influence** KwN's interests in hoary marmots.

Table 44: TKN Summary of fish status/trends, findings regarding ability to exercise rights, and relation to KUG Project Impacts, and, where relevant, proposed EAC conditions

Value	Health/Status	Ability to Exercise Rights			Anticipated KUG Project Impact	Anticipated KUG Project Impacts On Ability to Exercise Rights	Proposed Conditions
Aquatic		TLFN	TKD	KwN			
Peace Williston	• Reservoir affected areas: Arctic grayling, bull trout, lake trout, lake white fish, mountain whitefish, rainbow trout, kokanee; transition to a reservoir environment has created a number of issues deterring use; **traditional practices have been disrupted and new "reservoir environment" is perceived as dangerous, fish fauna has changed (preferred species are unavailable), fish are perceived as being unsafe to eat and recent studies suggest those perceptions are well founded**. New (stocked) species such as kokanee are flourishing. • Non-reservoir affected areas: (Nation Lakes, Germansen Lake, upper Finlay (Firesteel/Thutade), upper Kwadacha): Some of these areas are remote/distant, others are accessible and therefore popular and well used, **perception of risk of contamination and other factors are a deterrent to TKN use.** • Lake trout (non-reservoir populations): **9 of 28 naturally occurring lake dwelling populations demonstrate overharvest or heightened sensitivity to harvest.** • Dolly Varden: unique to Finlay and Ingenika river headwater drainages. **Kemess/Thutade area population has had contamination issues due to KS and substantial perception of risk of contamination exists.**	**Highly constrained.** Traditional practices have been disrupted and new "reservoir environment" is perceived as dangerous, fish fauna has shifted (preferred species unavailable), fish are perceived as being unsafe to eat and recent studies suggest those perceptions are well founded.	**Highly constrained.** Traditional practices have been disrupted and new "reservoir environment" is perceived as dangerous, fish fauna has shifted (preferred species unavailable), fish are perceived as being unsafe to eat and recent studies suggest those perceptions are well founded.	**Highly constrained.** Traditional practices have been disrupted, fish fauna has shifted (preferred species unavailable), fish are perceived as being unsafe to eat and recent studies suggest those perceptions are well founded.	1. 8,538 ha of area unavailable for use 2. Additional contaminated wastewater, seepage and TSF effluent that directly affect aquatic habitats and also pose addition environmental risk 3. Altered water quality and hydrology in receiving waterways and downstream areas (Attichika Creek and Waste Rock Creek) 4. Further deterrence of traditional use in the area through perception of risk of contamination relating to concerns about effluent and toxicity (environmental health) effects 5. Increasing numbers of anglers will access TKN Territories because of well-maintained access, resulting in increasing competition for resources and increasing harvest of resources (both adverse effects on TKN's harvesting activities)	**TLFN; Negative (Serious)** due to highly impacted baseline **TKD; Negative (Serious)** due to highly impacted baseline **KwN; Negative (Moderate)**. Downstream risk to aquatic environment (no direct effect within KwN Territory). Increased access issues related to ORAR. Some reservoir-effect within baseline; northern portion of KwN Territory largely undeveloped.	In order to address the potential effects on fish and fish habitat, the following conditions are proposed: **Fish and Aquatic Effects Monitoring Plan** to monitor concentrations of bio-accumulative contaminants in bull trout in Thutade Lake. **Se in Waste Rock Creek** ensures that there are no incremental effects to Se concentrations from the KUG Project. **Effluent Diffuser and IDZ** that would require AuRico to engage with TKN on the design of the diffuser to show how it minimized the length of the IDZ, and implement mitigation measures for any observed adverse effects of the IDZ on fish habitat use. **Staged discharge** from the TSF to Attichika Creek to a volume proportional to the Attichika Creek monthly streamflow and restricted to the open water months. **Treatment of the effluent from the TSF for metals and Se** to meet WQG or SBEB**.** **Construction EMP** would include requirements for sediment and erosion control measures to protect aquatic habitat.
Fraser	• Salmon (sockeye, chinook and coho): **poor status, access highly constrained**; (i.e. species are unavailable for harvest in some years and available in other years at levels insufficient to meet TKN needs, due to low returning abundance, restricted allocation and/or conservation closure) • Sturgeon: **access/harvest not possible**; (i.e. population is listed under SARA as Endangered; population has suffered a recruitment	**Highly constrained** (sockeye, chinook) **Not possible** (sturgeon/coho)	N/A	N/A	KUG Project does not affect the Fraser watershed	N/A	N/A

Value	Health/Status	Ability to Exercise Rights			Anticipated KUG Project Impact	Anticipated KUG Project Impacts On Ability to Exercise Rights	Proposed Conditions
Aquatic		TLFN	TKD	KwN			
	failure due to the damming, diversion and regulation of the Nechako River) • Other resident fish stocks (trout, char, whitefishes, burbot, minnows/chub, suckers, etc.): assumed to be healthy but information deficient (used by TKN but stocks are generally not actively managed/monitored)						
Skeena	• Sockeye (Bear): **chronically underperforming (under-escaping) due to over exploitation; highly sought after and used by TKN** • Sockeye (Sustut, Asitka, Johanson): **small stocks and data limited/suspected to be declining and underperforming** • Chinook (Bear): **declining returning spawner abundance, highly used** • Coho (primarily Bear): **returns improving recently, highly used** • Steelhead (Sustut/Bear): Bear population not monitored; **returns improving, highly used** • Resident fish stocks (trout, char, whitefishes, burbot, minnows/chub, suckers, etc.): status is assumed secure due to remoteness of area; information deficient (used by TKN but stocks are generally not actively managed/monitored)	**Not presently constrained**. Considerable risks to harvesting rights. Sockeye (Bear) primary food fish. Chinook (Bear) Coho (primarily Bear) Steelhead (Sustut/Bear) highly used.	**Not presently constrained**, considerable risks to harvesting rights. Sockeye and Steelhead (Sustut/Bear) highly used.	N/A	ORAR facilitates access to upper Skeena/Sustut watershed (pre-existing)	**TLFN/TKD; Negligible** (assuming adequate baseline)	In order to address the potential effects on fish and fish habitat, the following conditions are proposed: **Fish and Aquatic Effects Monitoring Plan** to monitor concentrations of bio-accumulative contaminants in bull trout in Thutade Lake. **Se in Waste Rock Creek** would ensure that there are no incremental effects from the KUG Project. **Effluent Diffuser and IDZ** that would require AuRico to engage with TKN on the design of the diffuser to show how it minimized the length of the IDZ, and implement mitigation measures for any observed adverse effects of the IDZ on fish habitat use. **Staged discharge** from the TSF to Attichika Creek to a volume proportional to the Attichika Creek monthly streamflow and restricted to the open water months. **Treatment of the effluent from the TSF for metals and Se** to meet WQG or SBEB**.** **Construction EMP** would include requirements for sediment and erosion control measures to protect aquatic habitat.
Peace – Eastern Slopes	Remote headwaters of Halfway/Graham rivers; Fish values assumed to be of high value and of healthy status but no monitoring information to support this assumption. Creation of Site C reservoir would adversely affect fish stocks associated with area.	N/A	**Assumed not presently constrained**	N/A	KUG Project does not affect the Peace-Eastern Slopes watersheds within the TKN Territories	N/A	N/A
Upper Stikine	(Upper Stikine, Spatsizi, Chukachida) Known to support grayling, rainbow trout, bull trout/dolly varden. Largely within protected areas and fish values	N/A	N/A	**Not constrained.** Important traditional use	KUG Project does not affect the Upper Stikine watershed within the TKN Territories (access	**KwN; Negligible** (assuming adequate baseline)	In order to address the potential effects on fish and fish habitat, the following conditions are proposed:

Value	Health/Status	Ability to Exercise Rights			Anticipated KUG Project Impact	Anticipated KUG Project Impacts On Ability to Exercise Rights	Proposed Conditions
Aquatic		TLFN	TKD	KwN			
	suspected to be healthy, but very limited fish inventory.			area	facilitated by ORAR)		**Fish and Aquatic Effects Monitoring Plan** to monitor concentrations of bio-accumulative contaminants in bull trout in Thutade Lake. **Se in Waste Rock Creek** would ensure that there are no incremental effects from the KUG Project. **Effluent Diffuser and IDZ** would require AuRico to engage with TKN on the design of the diffuser to show how it minimized the length of the IDZ, and implement mitigation measures for any observed adverse effects of the IDZ on fish habitat use. **Staged discharge** from the TSF to Attichika Creek to a volume proportional to the Attichika Creek monthly streamflow and restricted to the open water months. **Treatment of the effluent from the TSF for metals and Se** to meet WQG or SBEB**.** **Construction EMP** would include requirements for sediment and erosion control measures to protect aquatic habitat.
Liard	(Kechika/Gataga, Muskwa/ Tuchodi, Wokkpash). Important traditional use area with substantial ecotourism. Very limited inventory information available. Fish values suspected to be healthy due to remoteness. Concerns identified with increased access and localized harvest/disturbance in more accessed areas.	N/A	N/A	**Not constrained.**	KUG Project does not affect the Liard watershed within the TKN Territories	N/A	N/A

Table 45: TKN Summary of wildlife status, findings regarding ability to exercise rights, and relation to KUG Project Impacts, and, where relevant, conditions/mitigations

Value	Health/Status	Ability to Exercise Rights			Anticipated KUG Project Impact	Anticipated KUG Project Impacts On Ability to Exercise Rights	Relevant Conditions/Mitigations
Wildlife		TLFN	TKD	KwN			
Caribou	• 7 northern-most sub-populations (Spatsizi, Rabbit, Muskwa, Gataga, Frog, Finlay, Pink Mountain) **"Special Concern"** (SARA,2005). Finlay recognized to be in decline. • 4 sub-populations **"Threatened"** (SARA, 2003), recognized to be in decline. • Southern-most Scott population "Endangered" (COSEWIC, 2014).	**Highly constrained.** Four populations in decline. Scott population extirpated from portion of TLFN Territory.	**Highly constrained.** Likely worsening. Five of seven populations in decline.	**Moderately constrained.** Finlay population most accessible to KwN, declining.	1. Loss of hunting opportunity within access restricted area 2. Habitat alteration and disruption within KUG Project area 3. Increased licenced hunter access facilitated, resulting increase competition and harvest Note; KUG Project area is not actually encompassed within core range of recognized population (but caribou presence is common)	**TKD/TLFN/; Negative (Serious)** given the importance of caribou and the highly constrained baseline (and declining herds accessible within TLFN and TKD areas). **KwN; Negative (Minor to Moderate)** given the importance of caribou but no direct impact within KwN Territory, and moderately constrained baseline (considering most accessible – Finlay population)	In order to address the potential effects on caribou, the following conditions and other mitigations are relevant: • Mitigation measures required by the Wildlife Management and Monitoring Plan condition including the development and implementation of a Caribou Management and Monitoring Plan specifically address the key disturbances related to the KUG Project. The Wildlife Management and Monitoring Plan includes adaptive management to allow mitigation measures to change based on new information and monitoring results. EAO expects these will be effective in reducing the potential impact of the KUG Project on caribou. • A condition requiring AuRico to enter into an agreement with FLNRO that would set out the terms of AuRico's participation in a program of activities that supports the conservation and management of caribou in the KUG Project area. The agreement may require AuRico to contribute up to $30,000 toward the cost of implementing the program. • TKN will be involved in the ongoing monitoring of caribou and discussions of adaptive management related to caribou through the development and implementation of the Wildlife Management and Monitoring Plan and through the proposed Environmental Monitoring Committee. With continuing involvement, TKN will have influence to help ensure that the KUG Project does not adversely affect the long term reestablishment of the caribou population. • The KUG Project does not destroy CH. The only CH affected is related to use of existing infrastructure (ORAR). The land disturbance associated with the KUG Project is not in an area with established CH under SARA. • The CHPA study being conducted jointly by the provincial and federal governments is expected to result in better information on what is needed to protect Southern Mountain caribou and additional measures may be implemented. • Studies planned will inform both provincial initiatives as well as adaptive management for the Wildlife Management and Monitoring Plan, as well as coordination of initiative by FLNRO contemplated to address the multiple ORAR users and related effects.
Moose	Limited contiguous survey-monitoring information is available within the majority of the TKN Territories. Available information does not suggest broad scale decline, but there are localized areas that appear to have experienced **declines.**	**Moderately constrained.**	**Moderately constrained.**	**Moderately constrained.**	1. Loss of hunting opportunity within access restricted area 2. Habitat alteration and disruption within KUG Project area 3. Increased licenced hunter access	**TKD/TLFN/KwN; Negative (Moderate)** given the importance of moose and concerns re localized hunting pressure and concentrated harvest, and the ORAR's role in facilitating licenced hunter access. **KwN; Negative (Minor to Moderate)**; given the importance of moose and concerns re localized hunting pressure and concentrated harvest, and the ORAR's role in facilitating licenced hunter access; absence of direct effect on KwN Territory and much of KwN Territory without	In order to address the potential effects on moose, the Wildlife Management and Monitoring condition is proposed that includes the following measures specific to moose: • Mitigation for noise associated with blasting for wildlife; • Maintaining buffers from sensitive wildlife areas must be informed by approved Ungulate Winter Range General Wildlife Measures; • An ORAR Environmental Monitoring and Management Plan, which would include: o Mitigation measures to reduce attractants of roadside vegetation to moose; o Mitigation to manage snowbank heights to provide escape pathways (i.e., gaps) to allow wildlife to exit the plowed

Value	Health/Status	Ability to Exercise Rights			Anticipated KUG Project Impact	Anticipated KUG Project Impacts On Ability to Exercise Rights	Relevant Conditions/Mitigations
Wildlife		TLFN	TKD	KwN			
					facilitated, resulting increase competition and harvest	access and related effects.	roads; o Snow clearing mitigation measures to minimize snowmobile access along the ORAR; and o Monitoring of road dust on wildlife habitat; • Adaptive management to ensure unanticipated effects are mitigated.
Mountain goat	**BC CDC Blue listed/Special Concern**. Generally information deficient. The Province considers this species' status within the TKN Territories to be stable, based on available hunter harvest and effort data, and some population survey data. TKN have noted range retractions over time associated with reservoir development and industrial development (largely road access) and licenced hunting pressure.	**Moderately constrained**, based on historical effects.	**Moderately constrained**, based on historical effects.	**Moderately constrained**, based on historical effects.	KUG Project area is not coincident with goat habitat/range; ORAR has and would continue to facilitate licenced hunter access to sheep range, resulting in increased harvest.	**TKD/TLFN/KwN; Negative (Minor)**, baseline is assumed to be moderately constrained.	In order to address the potential effects on goat, the Wildlife Management and Monitoring condition is proposed that includes the following measures specific to goat: • Mitigation for noise associated with blasting for wildlife; • Maintaining buffers from sensitive wildlife areas must be informed by approved Ungulate Winter Range General Wildlife Measures; • An ORAR Environmental Monitoring and Management Plan, which would include: o Mitigation to manage snowbank heights to provide escape pathways (i.e., gaps) to allow wildlife to exit the plowed roads; o Snow clearing mitigation measures to minimize snowmobile access along the ORAR; and o Monitoring of road dust on wildlife habitat; • Adaptive management to ensure unanticipated effects are mitigated.
Stone's sheep	**BC Yellow-listed (Secure).** Generally information deficient. The Province considers this species' status within the TKN Territories to be stable, based on available hunter harvest and effort data, and some population survey data. TKN have noted range retractions over time associated with reservoir development and industrial development (largely road access) and licenced hunting pressure.	**Moderately constrained**, based on historical effects.	**Moderately constrained**, based on historical effects.	**Moderately constrained**, based on historical effects.	KUG Project area is not coincident with sheep habitat/range; ORAR has and would continue to facilitate licenced hunter access to sheep range, resulting in increased harvest.	**TKD/TLFN/KwN; Negative (Minor)**, baseline is assumed to be moderately constrained.	In order to address the potential effects on sheep, the Wildlife Management and Monitoring condition is proposed that includes the following measures specific to sheep: • Mitigation for noise associated with blasting for wildlife; • Maintaining buffers from sensitive wildlife areas must be informed by approved Ungulate Winter Range General Wildlife Measures; • An ORAR Environmental Monitoring and Management Plan, which would include: o Mitigation to manage snowbank heights to provide escape pathways (i.e., gaps) to allow wildlife to exit the plowed roads; o Snow clearing mitigation measures to minimize snowmobile access along the ORAR; and o Monitoring of road dust on wildlife habitat; • Adaptive management to ensure unanticipated effects are mitigated.
Grizzly bear	**COSEWIC "Special Concern", BC CDC Blue list.** 7 GBPU's within TKN Territories recognized as "viable". However, authors note that disturbance indicators related to development pressures are likely adversely affecting the two southern-most populations–Omineca and Nation.	**Moderately constrained.** Omineca and Nation GBPU's likely adversely impacted by development pressures. Will likely worsen.	**Not constrained.** Will likely worsen (Omineca GBPU likely adversely impacted by development pressures).	**Not constrained.**	1. Loss of hunting opportunity within access restricted area 2. Habitat alteration and disruption within KUG Project area 3. Likely mortalities	**TKD/TLFN/KwN; Negative (Negligible to Minor)**, baseline is assumed to be unconstrained.	In order to address the potential effects on grizzly bear, the Wildlife Management and Monitoring condition is proposed that includes the following measures specific to grizzly: • Mitigation for noise associated with blasting for wildlife; • An ORAR Environmental Monitoring and Management Plan, which would include: o Mitigation to manage snowbank heights to provide escape pathways (i.e., gaps) to allow wildlife to exit the plowed roads; o Snow clearing mitigation measures to minimize

Value	Health/Status	Ability to Exercise Rights			Anticipated KUG Project Impact	Anticipated KUG Project Impacts On Ability to Exercise Rights	Relevant Conditions/Mitigations
Wildlife		TLFN	TKD	KwN			
					associated with conflicts during operations 4. Increased licenced hunter access		snowmobile access along the ORAR; and o Monitoring of road dust on wildlife habitat; • Adaptive management to ensure unanticipated effects are mitigated.
Hoary marmot	The provincial status is considered **secure**. Within TKN Territories there is an absence of inventory and/or monitoring information.	**Not constrained.**	**Not constrained.**	**Not constrained.**	KUG Project would result in the mortality of hoary marmots and destruction of their habitats.	**TKD/TLFN; Negative – (Negligible to Minor)**, baseline is assumed to be unconstrained. **KwN; no impact**	In order to address the potential effects on hoary marmot, the Wildlife Management and Monitoring condition is proposed that includes the development of an Alpine Species Mitigation and Monitoring Plan with the following measures: o Mitigation and management measures to reduce effects of habitat loss/alteration and sensory disturbance from KUG Project infrastructure and activities in alpine and sub-alpine habitat where hoary marmot may reside; and o Adaptive management to ensure unanticipated effects are mitigated.

11.9.4.7 *Existing impacts to sites of importance to TKN*

The following impacts have occurred to specific sites and places of spiritual, cultural, and ceremonial value to TKN:

- Many TKN sites and places of import were inundated via Williston Reservoir;
- Many sites and places are seasonal harvesting/gathering areas, which have been directly affected by historical or ongoing development/management activities, and/or indirectly through declining health or abundance of resources that supported use at those locations; and
- The ORAR has facilitated access for non-TKN into TKN Territories, altering the context of many specific sites and places – creating competition for resources, and increased harvest of resources.

11.9.4.8 *Socio-Economic, Cultural, Spiritual, Health and Transmission of Knowledge Impacts*

TKN and EAO recognize that this EA largely focused on the KUG Project's biophysical impacts to the Aboriginal title, rights, and interests of the TKN First Nations. EAO and TKN acknowledge that AuRico assessed impacts to the Aboriginal title, rights and interest of the TKN First Nations in chapter 21 of the Application and funded a Traditional Land Use Study to support this assessment. However, TKN and EAO agree that for future EAs for projects proposed in the TKN Territories, EAO and TKN should discuss in pre-Application how and to what extent the EAs should focus on the socio-ecoomic, cultural, spiritual, health and knowledge transmission elements of the Aboriginal title, rights, and interests of the TKN First Nations in greater detail through specific studies commissioned to assess such impacts in collaboration with TKN.

Nevertheless, further constraining TKN members' ability to harvest fish and wildlife resources in the TKN Territories would cause corresponding adverse impacts to the socio-economic, cultural, spiritual, health, and knowledge transmission elements of the Aboriginal title, rights, and interests of the TKN First Nations. EAO and TKN are proposing a cultural awareness and recognition condition to the EAC.

11.9.4.9 *Decision-making regarding the lands, water, air, and resources in the TKN Territories*

TKN asserts the right to determine how lands within the TKN Territories will be used, particularly in terms of resource extraction and related developments that alter and/or

alienate lands from their preferred use. TKN also assert the right to proactively use and manage the lands, water, air, and resources in the TKN Territories.

As set out above, TKN members continue to use and manage the lands, water, air and resources in a manner reflective of their historical and inherent role as stewards of the TKN Territories, including by using their detailed collective knowledge and historical occupation of the TKN Territories to maintain an understanding of their overall health and to ensure long-term sustainability.

The KUG Project would directly alienate up to 8,538 ha for a specified duration, with portions of that area being highly altered from a natural state for the long-term, with adversely altered water characteristics arising from the site beyond the long-term. It also has the potential to cause adverse effects to the lands, water, air, and resources in the TKN Territories, and corresponding adverse impacts to the Aboriginal title, rights, and interests of the TKN First Nations.

Importantly, the Province and AuRico are taking significant steps to both recognize and accommodate the TKN First Nations' role in deciding how the lands, water, and resources in the TKN Territories will be used. The Province is doing so through the collaboration with TKN on this EA, future collaboration during the permitting stage, as well as through the current G2G negotiations with TKN outside of the EA process. AuRico is doing so through IBA negotiations with TKN. Both of these efforts are aimed at seeking consensus with TKN in relation to the KUG Project.

Importantly, there is a need to secure TKN's ongoing ability to discharge its stewardship responsibilities and obligations through EAC terms and conditions, terms and conditions for future KUG Project-related permits, as well as G2G agreement(s) and the IBA.

11.9.4.10 *Economic benefits of the land and resources in the TKN Territories*

The TKN First Nations assert a right or ability to benefit from uses of the land and resources in the TKN Territories. This includes deriving benefits from the use of TKN Territories and pursuing economic development opportunities in a variety of ways; whether related or unrelated to modern forms of natural resource development and extraction. In addition, this encompasses accessing and using natural resources by preferred means, which use includes wild foods for the contemporary TKN communities and their ancestors, as well as for sale, trade, or barter as TKN members' ancestors did historically.

On one hand, the KUG Project has the potential to cause serious adverse impacts to the economic elements of the Aboriginal title, rights, and interests of the TKN First Nations. For the reasons set out above, proceeding with the KUG Project would: (i) prevent TKN from using the lands, water and resources in the Restricted Area for their economic benefit; (ii) prevent and/or significantly impede TKN's ability to harvest fish, wildlife, plants, and other resources in the Restricted Area. This would have a multitude of economic impacts, including requiring TKN members to purchase store-bought food to replace wild food, etc.; and (iii) result in the extraction of the subsurface mineral resources by a third party.

On the other hand, the KUG Project has the potential to provide significant economic benefits to TKN and its members, including through: (i) employment opportunities; (ii) contracting opportunities; and (iii) revenue sharing arrangements.

Importantly, TKN, the Province, and AuRico are taking significant steps to ensure that TKN and its members benefit economically if the KUG Project proceeds through negotiated arrangements in G2G agreement(s) and an IBA.

11.9.4.11 *TKN's Summary Findings; Project Impacts on the Aboriginal Title, Rights, and Interests of the TKN First Nations*

While the KUG Project is not anticipated, on its own, to cause detrimental effects to the status of key fish and wildlife populations, or alter or alienate large proportions of the TKN Territories from TKN-use, the KUG Project would incrementally contribute to factors that have already resulted in the diminished status of those key species, and/or other factors impacting the abilities of TKN members' to exercise the Aboriginal title, rights, and interests of the TKN First Nations. In that sense, each new impact, even where such an impact can be considered to be incremental on its own, would be highly significant from TKN's perspective.

TKN's assessment of the KUG Project's impacts on the Aboriginal title, rights, and interests of the TKN First Nations would therefore be of a higher magnitude than described in the Application, and are characterized as serious/significant in some cases. The difference between the findings of Part B of the Application and the assessment presented herein stem from differences in methodologies/approaches that include:

a. The assessment presented herein was based on the broader spatial context of the entire TKN Territories and fish and wildlife supporting harvesting rights within the TKN Territories, whereas the Application was based on limited study areas related to the KUG Project and its components.

b. AuRico did not contemplate the TKN's current ability to exercise the Aboriginal title, rights, and interests of the TKN First Nations in the broader TKN Territories; conversely, in this assessment, current conditions were assessed based on the health-status (availability) of key fish and wildlife species that support the meaningful exercise of their Aboriginal title, rights, and interests within their respective Territories. The lack of consideration of the TKNs' current "abilities to exercise" their rights within AuRico's assessment leads to residual impacts either not being recognized or being characterized as insignificant.

c. In this assessment, adverse effects on indicators (and causative factors) that have already exceeded recognized risk-impact thresholds, or are currently declining, are appropriately characterized as being significant or more consequential, respectively.

11.10 Other Mitigation Measures, EAC Conditions, and Accommodation Measures

11.10.1 Mitigation Measures

Since the IMA was signed by TKN and AuRico in 2012, their relationship has been characterized by collaboration and an interest based approach to TKN concerns regarding the KUG Project. This relationship continued into the EA process for the KUG Project and is exemplified by the water discharge alternatives assessment carried out by AuRico. This assessment was a rigorous process that included extensive consultation with TKN leadership, community members and technical consultants. In the final analysis, the views and concerns of TKN featured very prominently in this assessment and contributed to the decision by AuRico to select Attichika Creek to receive discharges of water from the KUG Project TSF (a decision that was supported by TKN) and a commitment by AuRico for water treatment.

In AuRico's Application and responses to comments or questions by TKN and other members of the Working Group regarding the Application, AuRico has committed to implement mitigation measures to avoid or mitigate the effects of the KUG Project. Table 25.3.1 of the Application contains a list of some of these mitigation measures. AuRico updated their list of mitigation measures during the EA to include those commitments made in responses to comments by TKN and other members of the Working Group. EAO then described how these mitigations are captured in proposed conditions or how effects of the KUG Project related to these proposed mitigations would be regulated through management plans or information requirements during permitting as required under the Mining Code and Joint Application Information Requirements for MA and EMA Permits (MEM & ENV, 2016) through engagement

described in the permitting collaboration plan currently being developed. TKN has compiled detailed comments on this mitigations table which will be presented to the Province for its consideration during permitting. Also, the TOC in Schedule B reflects some of these mitigation measures while other mitigation measures will be incorporated into management plans or other programs to be developed and implemented by AuRico if the KUG Project is eventually built and operated.

TKN has noted that not all of its concerns regarding the potential effects of the KUG Project and mitigation measures were addressed in the EA for the KUG Project. This is primarily due to the current state of design and planning for the KUG Project. Without greater information about design and planning for specific components of the KUG Project (e.g. design of the KUG Project TSF dam or the length of the IDZ for discharges of water into Attichika Creek), it is not feasible at this stage to prescribe specific mitigation measures for those components. However, TKN expects that if an EAC is granted for the KUG Project and AuRico proceeds with MA and other permitting for the KUG Project, TKN's outstanding concerns and interests will be considered and addressed, as appropriate, in the permitting process; as will be discussed below in section 11.10.3.2, TKN and the Province (led by the Major Mine Permitting Office) intend to collaborate during the permitting phase of the KUG Project. In particular, TKN and the Province have to date agreed during the permitting phase of the KUG Project to collaboratively consider how issues raised around potential effects may be better and further addressed in permitting, which may include:

- Mitigation planning for the mine dewatering to assess impacts to surface water quality for the scenario that Gossan zone water quality infiltrates the cave zone;
- Technical details and monitoring plans for the decline plugs;
- Locations and other details of ground and surface water monitoring programs;
- Water treatment and receiving environment specifications and standards;
- Consider/assess the need for long-term water treatment;
- Address selenium levels in Waste Rock Creek;
- Discharge characteristics and length of the IDZ;
- KUG Project TSF facility design, operations and monitoring;
- Feasibility of extended beach of the KUG Project TSF;
- Wildlife monitoring and management plan details (including relating to the ORAR, caribou, alpine species, birds and other wildlife issues [bats, moose]);
- Specifics of monitoring contaminants in fish in Thutade Lake;
- Wetlands management and monitoring plan details;
- Mitigation for accidents and malfunctions including those identified as "failure modes with low environmental risk" in Appendix 22-A of the Application;
- A fish and wildlife response plan in the case of spills (This may require an update to the Emergency Response Plan);
- Follow-up monitoring for leak/spill of hazardous substances stored on-site; and
- A dam breach and inundation study for the KUG Project TSF.

11.10.2 EAC Conditions

The Collaboration Plan adopted by TKN and EAO for the KUG Project EA contains a commitment by TKN and EAO to collaboratively draft and work towards consensus on proposed EAC conditions (should an EAC be issued) related to the Aboriginal title, rights, and interests of the TKN First Nations.

TKN and EAO agree that, for the most part, these objectives were met. TKN and EAO met from time to time to develop, review and discuss proposed EAC conditions, as discussed in section 11.10. Also, AuRico participated in these meetings when necessary. Through this collaboration by TKN and EAO, general agreement was reached by TKN and EAO on the proposed TOC in Schedule B. TKN's view is that within the constraints of EA process, by and large TKN's concerns and interests were adequately addressed through that process when combined with other forms of accommodation.

11.10.3 Accommodation

TKN recognizes the efforts made by AuRico and the Province to accommodate the Aboriginal title, rights, and interests of the TKN First Nations. This accommodation includes the following.

11.10.3.1 *AuRico*

AuRico and TKN are close to agreement on an IBA for the KUG Project. This agreement will build on the IMA signed by TKN and AuRico in 2012. The IBA will be a progressive agreement that includes (among other things) commitments by AuRico on employment and training for TKN members, business opportunities for TKN businesses, a financial component, and a role for TKN in monitoring, assessing and managing the effects of KUG on the environment and the Aboriginal title, rights, and interests of the TKN First Nations. Like the IMA, the IBA will also establish efficient and effective structures and mechanisms for ongoing collaboration by TKN and AuRico throughout the life of the KUG Project.

Finalizing and fully implementing the IBA are of paramount importance to TKN in accommodating the Aboriginal title, rights, and interests of the TKN First Nations and will be critical to building and maintaining ongoing TKN support for the KUG Project.

11.10.3.2 *Province*

The Province has taken the following steps during the EA process to accommodate the Aboriginal title, rights, and interests of the TKN First Nations:

1. The KUG Collaboration Plan entered into by TKN and EAO is an important initiative and is viewed by TKN and EAO as a form of accommodation of the governance aspect of Aboriginal title, rights, and interests of the TKN First Nations. With its focus on implementing a G2Grelationship in the EA process, recognizing TKN's role as stewards of the TKN Territories, and striving for consensus where possible, this initiative enabled TKN's views, concerns and interests to be presented and considered, and integrated in the various elements and decisions throughout the EA process in a respectful, constructive and effective manner. It was also crucial in increasing understanding of and building support for the EA process for the KUG Project within TKN communities. TKN and EAO plan to build on the success of the KUG Collaboration Plan by exploring a longer term collaboration plan for the KUG Project that may include collaboration on future amendments to and oversight of implementation of the conditions of an EAC for the KUG Project, should an EAC be granted.

2. To a significant extent, the table of proposed EAC conditions was arrived at through collaboration by TKN, EAO and other members of the Working Group. It includes conditions proposed or supported by TKN. TKN and EAO view these proposed EAC conditions as a form of accommodation.

As set out above, TKN and the Province have recognized the limitations of the EA process in addressing or accommodating all of the elements of the Aboriginal title, rights, and interests of the TKN First Nations in relation to the KUG Project. For that reason, TKN and the Province have established other collaborative processes and negotiation tables to do so, which include the following:

3. TKN and the Province (led by the MMPO) are discussing a collaboration plan for the permitting phase of the KUG Project. The intention is to draw from and build on the success of the KUG Collaboration Plan adopted for the EA process. TKN expects the collaboration plan for permitting of KUG to be finalized shortly. TKN and EAO view this commitment by the Province to collaborate on permitting, including striving for consensus, as a form of accommodation. It will be of critical importance to TKN to collaboratively address the unresolved environmental effects identified above in section 11.10.1 during the permitting phase of the KUG Project in order to build and maintain TKN support for it, and properly accommodate the Aboriginal title, rights, and interests of the TKN First Nations.

4. An agreement in principle exists between TKN and the Province to create a G2G table to consider and, where appropriate, address specific issues or

concerns identified by TKN in relation to the KUG Project and surrounding area. These include issues and concerns that cannot be adequately addressed through the EA or permitting processes for the KUG Project, including effects on the Aboriginal title, rights, and interests of the TKN First Nations that cannot be avoided, should the KUG Project proceed. Matters being discussed relate to management of lands at Thutade Lake and Amazay Lake monitoring and management of the ORAR, and access for TKN members to training programs and services to qualify them for jobs at KUG. TKN and the Province are close to finalizing an agreement that establishes the G2G table and how the G2G process will proceed.

5. The Province has committed to negotiate an ECDA for the KUG Project with TKN First Nations. Under this agreement, the Province outlines how it intends to share mineral tax revenues from the KUG Project with TKN if the KUG Project is eventually developed and operated. Negotiations on the ECDA are ongoing and are led by TKN and provincial representatives. TKN expects that ECDAs for each of the TKN First Nations will be concluded in a timely manner. TKN's view is that the ECDAs for each of the First Nations will contribute to accommodation for the KUG Project's effects on the Aboriginal title, rights, and interests of the TKN First Nations.

Accommodation measures 4 and 5 are, at this point, procedural commitments only. It will be essential for TKN and the Province to address the substantive matters set out therein as part of accommodating the effects of the KUG Project on the Aboriginal title, rights, and interests of the TKN First Nations.

11.11 Conclusion regarding the adequacy of the Crown's consultation and accommodation

The following section identifies the Parties' perspectives on the adequacy of the Crown's consultation and accommodation of the Aboriginal title, rights, and interests of the TKN First Nations in respect of the EA of the KUG Project.

Collaborative Process

The April 2015 CA refers to a previous commitment of the parties to "develop a new relationship to facilitate economic opportunities for CSFN, shared decision-making, planning as well as environmental and cultural stewardship in relation to natural resource development" (Preamble A). TLFN was one of the signatories to that CA and through a series of discussions between EAO and TKN, the Province agreed to apply the relevant provisions within the CA to all three TKN Nations. As discussed above in Section 11.4, CA was key to framing the Crown's approach to consultation and

accommodation measures with respect to the EAO assessment processes.

The Province and TKN co-drafted the KUG Collaboration Plan to facilitate collaboration and seeking consensus on key decisions related to the EA Application and its review. The primary motivation of the KUG Collaboration Plan was to ensure that the process of reviewing and considering “Certification” of the KUG Project follows the spirit and intent of the CA, including addressing the potential adverse effects of the KUG Project on the Aboriginal title, rights, and interests of the TKN First Nations.

As described above in section 11.4, the KUG Collaboration Plan contains a commitment by TKN and EAO to collaboratively draft and work towards consensus on proposed EAC conditions (should one be issued) related to the Aboriginal title, rights, and interests of the TKN First Nations. The Collaborative Processes captured via the KUG Collaboration Plan can be broken down into the following three phases:

1. Collaboration Plan Development
2. Collaborative EA Application and Review
3. Collaborative Drafting of Part C and EAC conditions, and Recommendations

Through the shared evaluation of the development and implementation of the KUG Collaboration Plan, TKN maintains that the EAO made a good faith effort to consult and accommodate through all phases of collaboration during pre-Application, and during the EA Application Review. Specifically the points to highlight on the successes of the implementation of the Collaboration Plan include:

1. Collaboration Plan Development
    a. BC was able to accommodate the interests of the TKN and apply the KUG Collaboration Plan to all three TKN Nations; this is despite initial concerns that it would only apply to TLFN.
    b. The Collaboration Plan was finalized late in the EA. BC and TKN implemented the draft “living” plan and moved forward under its provisions prior to its finalization.

2. Collaborative EA Application and Review
    a. Collaborative processes between the EAO and TKN to discuss whether the Application satisfied the requirements of the Section 11 Order and the AIR.
    b. On the whole, there was a willingness to work together; TKN worked within regulatory requirements, EAO acknowledged the Aboriginal title, rights, and interests of the TKN First Nations.
    c. Communication was consistent and facilitated exchange on viewpoints, a

mutual respect was developed through regular interface.

d. EAO staff willing to treat TKN as another level of government.
e. Capacity building opportunities regarding the EA and permitting processes were provided by way of EAO and MMPO community presentations for TLFN and KN. These meetings were well-attended and provided knowledge about the role of the EAO and how collaboration would be implemented. Community feedback from these meetings was that it marked a tangible shift in consultation.
f. EAO and TKN discussed the methodology to consider KUG Project impacts to the Aboriginal title, rights, and interests of the TKN First Nations, which informed the Eco Report and the drafting of this Part C. Those discussions have also provided the basis for ongoing dialogue among the parties about how the EAO can continue to update its methods for assessing the impacts of projects on the Aboriginal title, rights, and interests of First Nations in future EA processes to better capture indigenous worldviews, perspectives, customs, practices, and traditions.

3. Collaborative Drafting of Recommendations
    a. EAO and TKN worked together to ensure that a deep understanding of the nature of potential KUG Project impacts on the Aboriginal title, rights, and interests of the TKN First Nations was considered and described in Part C.
    b. That deeper understanding of the potential KUG Project impacts on the Aboriginal title, rights, and interests of the TKN First Nations supported the parties' collaborative efforts to develop appropriate EAC conditions that captured and addressed TKN's concerns.
    c. EAO engaged MMPO immediately such that TKN interests that cannot be adequately addressed through EAC conditions may be addressed through "Collaborative" permitting.
    d. EAO proposed conditions that would provide mechanisms to ensure collaboration is ongoing (life of mine).

<u>Summary Conclusions</u>

The parties recognized that EAO's role extends only to consultation and accommodation necessary for the purpose of the EA decision and could not necessarily meet or address all of TKN's concerns or interests with respect to the potential KUG Project impacts on Aboriginal title, rights, and interests of the TKN First Nations. As set out above, TKN and the Province have established a G2G Table and are working on a collaboration plan for the permitting phase of the KUG Project to pursue issues that fall outside of what is appropriately addressed through an EA.

Ultimately, accommodation measures committed to and/or proposed by the Province with respect to the KUG Project exist at three levels: 1) regulatory as demonstrated through collaboration on the EA and permitting;2) the negotiation of ECDAs for the KUG Project with TKN First Nations, whereby BC has offered to share mineral tax revenues from the KUG Project with TKN if the KUG Project is eventually developed and operated, and; 3) the creation of a G2G Table to consider and negotiate other forms of accommodation.

Several mitigation measures were collaboratively developed which are discussed above in sections 11.9.2.3 and 11.10. This includes a collaborative approach to developing permitting conditions.

While there are two areas within the KUG Collaboration Plan where EAO and TKN represent their respective views the final plan comes very close to articulating a set of common interests. In fact, the EAO Collaboration Plan framework is now being applied to the permitting process through the MMPO. TKN views ongoing collaboration throughout permitting and the discussions at a G2G level regarding other measures to address the concerns TKN has raised that are outside of the EA process as crucial for the Crown to meet its consultation and accommodation obligations with respect to all provincial authorizations required for the KUG Project.

TKN participated with EAO in a collaborative process during the EA, with the opportunity to ensure that the environmental and stewardship concerns of the TKN were well understood and potential KUG Project impacts to the Aboriginal title, rights, and interests of the TKN First Nations appropriately accommodated. Ultimately, EAO and TKN were successful at developing accommodations achievable through the EA process.

TKN and EAO agree that the collaborative process has resulted in a productive and positive consultation process that led to many forms of mitigation that will reduce and/or minimize adverse effects on TKN’s interests, including monitoring and adaptive management mechanisms that will be ongoing, should the KUG Project proceed. The collaborative process has also facilitated the creation of the G2G Table with BC and TKN where the process of accommodating TKN for the non-mitigatable effects of the KUG Project on the Aboriginal title, rights, and interests of the TKN First Nations have been committed to be addressed.

TKN and EAO agree that the collaborative process has resulted in adequate mitigation and accommodation of the potential effects of the KUG Project on the Aboriginal title, rights, and interests of the TKN First Nations at the EA stage.

Because TKN and EAO were able to reach agreement on the adequacy of mitigation and accommodation at the EA stage, and given the broader approach taken by TKN to assess cumulative impacts within a broader geographic area encompassing the TKN Territories, EAO and TKN agreed to capture TKN's perspectives on the impacts of the KUG Project on the Aboriginal title, rights, and interests of the TKN First Nations rather than identifying and discussing areas of agreement or disagreement. TKN and EAO were able to focus on ensuring that TKN was able to clearly articulate its perspectives and on collaboratively developing appropriate mitigations and accommodations.

11.12 Weighing Residual Impacts

11.12.1 Importance of the KUG Project to the Province

The KUG Project is expected to provide close to 4,000 person-years of employment: 1127 person-years during construction, and 2863 person years during operations. The workforce would peak with approximately 400 people by year 2, due to increased labour needs for development, production, maintenance, technical and management-supervision. This level of workforce personnel is expected to be maintained through year 4. Years 5 to 10 have total workforce complements ranging from 295 to 183, after which complements are expected to decline as the end of the mine's life is reached. The total life of mine capital cost is estimated to be $683 M.

An estimated $236 M would be paid in provincial and federal taxes, including approximately $63.8 M in provincial corporate tax, $87 M in federal corporate tax, and $86 M in BC mineral tax.

11.12.2 Impacts and Benefits to Affected Aboriginal Communities

The KUG Project has the potential to produce substantial long-term benefits for TKN First Nations. TKN is of the view that these benefits (if they are actualized) outweigh the risks associated with the potential effects of the KUG Project on the environment and the Aboriginal title, rights, and interests of the TKN First Nations.

In general, the potential benefits to TKN collectively and individually from the KUG Project may include the following (assuming an IBA is concluded and agreement is

reached with the Province on other forms of accommodation):

- School based initiatives to improve educational outcomes for TKN members (IBA).
- A broad range of employment and training initiatives for TKN members (IBA).
- Business opportunities for TKN businesses during construction and operation of the KUG Project (IBA).
- New partnerships, joint ventures and other arrangements by TKN with companies and businesses that intend to bid on contracts to supply goods and services to the KUG Project.
- Financial benefits to TKN communities from the IBA and ECDA that will support the TKN communities in addressing their infrastructure needs and community-based programs and services (e.g. housing, health and wellness, etc.).
- Increased capacity for governance within the TKN First Nations through participation in the processes established under the IBA and G2G agreements or other arrangements with the Province.
- Respect for Aboriginal, title, rights and interests of the TKN First Nations.

Schedule C Aboriginal Groups Consultation

12. Aboriginal Groups Consulted

The BC EA of the KUG Project was substituted for the federal EA as set out in the MOU. As set out in accordance with the process in the MOU, EAO conducted procedural aspects of Aboriginal consultation on behalf of both the provincial and federal Crown for the EA of the KUG Project.

In accordance with the order under Section 11 of the Act issued to AuRico on May 14, 2014 and the orders under Section 13 of the Act issued on June 23, 2014, November 14, 2014, and December 21, 2016, the Aboriginal groups below were included on Schedule C:

- wilp Nii Kyap, Gitxsan Nation (Gitxsan);
- the following signatories to Treaty 8:
    - DRFN;
    - HRFN;
    - PRFN;
    - SFN;
    - WMFN;
    - FNFN;
    - BRFN;
    - MLIB; and
    - MNBC.

Consultation Overview

The Crown consults with Aboriginal groups for many reasons, including statutory, contractual, policy and good governance (including building effective relationships and understanding of Aboriginal group communities), as well as the constitutional duty to consult. Through the consultation process, the Crown seeks to reconcile Aboriginal Interests with the interests of the Crown and broader societal interests, while upholding the principle of the honour of the Crown.

12.1 Wilp Nii Kyap, Gitxsan (Gitxsan)

12.1.1 Context

- The Gitxsan share a common society, culture and language with their Tsimshian and Nisga'a neighbours. The Gitxsan are a composite group comprising lineages of both Tsimshian and Athapaskan heritage. Gitxsan lineage histories (adaawk) tell of an ongoing integration of Athapaskan peoples from the upper reaches of the Nass and Skeena watersheds into Tsimshian speaking communities in the middle Skeena region.
- In the 19th century the Gitxsan were organized into seven independent winter villages: Kispiox, Kisgaga̱as, Gitsegyukla (Kitsegukla), Gitwangak (Kitwanga), Gitanmaax (Kitanmaks), Galdo̱o (Kuldo) and Kitwancool (Gitanyow). These winter village aggregations usually consisted of two or more houses or huwilp. The basic social unit of Gitxsan society was the *wilp*, a corporate matrilineage whose core members lived together, and are led by a hereditary chief (Simgiigyet). Each *wilp* is associated with one of four larger descent groups known as "clans" or pdek: Lax Ganeda (Raven); Lax Se̱el (Frog); Lax Gibuu (Wolf); and Gisḵaast (Fireweed / Killer Whale / Grizzly). Whereas the *wilp* is a local residential group with control over certain areas, the pdek is a much broader unit of association which transcends huwilp, winter village aggregates and even the boundaries of the greater Gitxsan society.
- Currently, there are between 50 and 65 huwilp (houses) within Gitxsan traditional territory. Each Simgiigyet is responsible for managing distinct sections of the *wilp* territories and fishing sites, with additional wing-chiefs who assist with management in each house territory. The Simgiigyet has the ability to make decisions about his or her territories, but does not hold exclusive power within the *wilp*. Each *wilp* owns a set of hereditary names that are assigned power and authority based on their individual ranking and are linked to specific territories. Impacts to a territory may have an impact on that *wilp* and its ability to feast and access resources to demonstrate their wealth and jurisdiction, an integral aspect of Gitxsan culture. Under Gitxsan traditional law, an impacted *wilp* may not simply move into a neighbouring territory to access its resources, although the neighboring *wilp* may choose to permit access. The Liligit (feast hall), or potlatch, is a structure that legitimizes business, social and political decisions in the traditional system. In Gitxsan society, ayookw (traditional laws) govern a number of activities that occur in *wilp* territories, including conservation, citizenship, adoption, marriage, property, use of resources and personal conduct at the Liligit.
- In the absence of a single entity with the mandate to represent the Gitxsan Nation as a collective during the period that the EA was underway, EAO

consulted with the Simgiigyet whose huwilp could be impacted by the KUG Project, which was *wilp* Nii Kyap. For the purposes of this Assessment Report, “Gitxsan” will generally refer to *wilp* Nii Kyap.

- The Gitxsan claim a 33,000 km^2 traditional territory situated on the Skeena River above the Kitselas Canyon, and in the watersheds of the Babine, Kispiox, Gitsegukla, Lower Skeena, Middle Skeena, Nass, Suskwa, Sustut and the upper Skeena and their tributaries.
- Traditionally, Gitxsan followed a seasonal round of resource procurement focused on fishing, hunting, trapping, and medicinal and food plant gathering within the Skeena and Nass watersheds. The basis of their economy was salmon, which was not only a dietary staple, but also an important trade item that was used to procure eulachon grease and other items from coastal First Nations. Salmon are harvested during the summer sockeye runs and the fall Coho runs and steelhead trout are fished at various times throughout the year. In winter, char, Dolly Varden and cutthroat trout are harvested. Eulachon are also harvested on the lower Nass River in the early spring.
- Hunting and trapping was common, providing dried meat, hides and fur for personal consumption and trade. Gitxsan also harvested and processed a variety of berries, including soapberries, which were given to coastal First Nations in exchange for seaweed and shellfish.
- Gitxsan used trails and travel ways as trade routes, or to connect villages to hunting, fishing, trapping and plant gathering sites. The Skeena River was also an important corridor for transporting goods and people between the coast and the interior by canoe, however, trails beside watercourses or overland were considered more reliable for year-round travel.

12.1.2 Aboriginal Interests and EAO’s Assessment of KUG Project Impacts and Depth of Consultation

- A Statement of Intent map produced by the BC Treaty Commission, 1994, indicates that the northeastern boundary of Gitxsan traditional territory overlaps with the RSA for the assessment of effects of changes to the environment on Aboriginal peoples (see Figure 20.3-1 of the Application) of the KUG Project, and portion of the LSA, though not within the KUG Project Area (i.e. the area of existing and proposed KUG Project infrastructure).
- The map, “Gitxsan Territory” produced by the Gitxsan Treaty Office in 2007, shows the KUG Project as entirely within the Gitxsan traditional territory, which extends east to Ingenika River to the north to the Firesteel and Finlay Rivers. In this map, the KUG Project is show as within the Tutadi territory of *wilp* Nii Kyap in the Sustat watershed administrative area.

- EAO reviewed available information, including the affidavit describing the Nii Kyap Tutadi (Thutade) territory prepared for the *Delgamuukw* Supreme Court Decision trial and notes that the latter describes the eastern boundary of the territory in the vicinity of the KUG Project as extending east of the height of land next to the Niven river northward to the northeast end of the Tutadi (Thutade) Lake. EAO understands this to exclude Amazay Lake and the KUG Project. EAO does not have any specific information that describes Gitxsan use or occupancy of the KUG Project area.
- Given the nature and location of the KUG Project, EAO identified a potential for downstream effects to Gitxsan's Aboriginal Interests, associated with fishing linked to water quality specifically due to discharge of treated water into Attichika Creek which is a tributary to Thutade Lake located in *wilp* Nii Kyap territory. EAO's initial assessment was the effects from the KUG Project would be negligible due to project design including water treatment. Based on this assessment EAO is of the view that the duty to consult Gitxsan lies at the low end of the *Haida* spectrum. This level of consultation required EAO to provide Gitxsan with notifications of key milestones during the EA review process, and the opportunity to comment on the draft Assessment Report and EAO's consultation report. Gitxsan is listed on Schedule C of the Section 11 Order.

12.1.3 Summary of Consultation

EAO provided Gitxsan with notification of key milestones for the KUG Project such as the issuance of the AIR, Section 11 and 13 orders, acceptance of the Application for review and timing of public comment periods. EAO also provided an opportunity to review and provide comments on the draft Assessment Report which includes draft conditions for an EAC, and EAO's draft consultation report (Part C of this report). Gitxsan also has the opportunity to comment on draft federal conditions for a Decision Statement during the public consultation period on the draft Assessment Report. In addition, EAO offered to meet directly with Gitxsan, all of these consultation efforts were aimed at providing opportunities for Gitxsan to discuss concerns about the KUG Project, to provide information on Gitxsan's uses in the KUG Project area, and to identify potential impacts on Gitxsan's Aboriginal Interests from the KUG Project.

AuRico initiated consultation with Gitxsan in July 2011 regarding the MA Notice of Work. Prior to the commencement of the EA, in February 2013, AuRico met with Gitxsan to discuss the KUG Project and respond to questions relating to employment and contract opportunities and the EA process. Soon after the EA started, in March 2014, AuRico met with Gitxsan regarding the Project Description and to provide an update on the

KUG Project. At this meeting, Gitxsan expressed an interest in employment and training opportunities.

During the pre-Application stage of the EA, AuRico communicated with Gitxsan regarding the following:

- An inquiry about the availability of qualified Gitxsan workers;
- Evidence from the Williams and Delgamuukw Supreme Court of Canada cases;
- Gitxsan's offer to provide a map to AuRico showing the boundaries of the Gitxsan *wilp* territories (the "Gitxsan Territory" boundary map was provided by the Gitxsan Chief's Office in July 2014 to AuRico) as evidence that the boundary of *wilp* Nii Kyap territory overlaps with the KUG Project;
- Gitxsan Chief's interest in taking a helicopter tour with a stop at the KUG Project site, in the summer (Gitxsan Chiefs did not participate in a KUG Project site tour; despite AuRico's offer);
- A description of the process for collecting information and assessing potential effects in accordance with Section (5)(1)(c) of CEAA 2012;
- AuRico provided draft reports on AuRico's understanding of Gitxsan history, CULRTP, health and socio-economic conditions and cultural heritage, and assessment of the effects of environmental changes caused by the KUG Project on Gitxsan in accordance with CEAA 2012 (5)(1)(c), for Gitxsan's review and comment. No comments were received; and
- Various KUG Project updates.

Throughout the EA, Gitxsan provided numerous emails and/or letters to EAO that:

- commented on EA documents;
- provided EAO with information on Gitxsan's key concerns and issues regarding the KUG Project;
- expressed Gitxsan's view that they should be consulted regarding the KUG Project at a deeper level than notification based on the evidence of overlap of *wilp* Nii Kyap territory with the KUG Project as identified on the "Gitxsan Territory" boundary map, which identifies the KUG Project falls within the Sustut Administrative Area; and
- additional information on *wilp* Nii Kyap's historical use of the KUG Project area.

EAO provided responses to the emails and letters, including letters dated March 19, 2014 in which EAO provided its initial view and March 11, 2016, in which EAO provided its updated view, on the appropriate level of consultation based on available information, and EAO's understanding of Gitxsan's Aboriginal Interests in the KUG Project area. In the letter dated March 19, 2014, EAO acknowledged that the

historical information currently available suggests Gitxsan used the area around Thutade Lake prior to contact sometime in the early 1800's before moving to the Gitxsan village of Kisgegas near the confluence of the Skeena and Babine Rivers, approximately 70 km from the KUG Project. However, in EAO's view it is not clear from that information precisely when this migration took place and how close to the time of contact that it occurred. Therefore, while some of the details remain unclear, EAO's initial assessment is that there is a moderate *prima facie* claim to Gitxsan Aboriginal rights in the area of the potential downstream impacts from the KUG Project to Attichika Creek.

In the letter dated March 11, 2016, EAO set out how it considered its assessment on the scope of the duty to consult in the view of the June 26, 2014, Supreme Court of Canada decision in *Tsilhqot'in Nation vs. BC* (which clarified the test for Aboriginal title relating to the elements of sufficient and exclusive occupation at 1846), and information provided by Gitxsan. EAO stated that it holds the initial view that there is no information that indicates sufficient and exclusive occupation at 1846 to support a *prima facie* claim of Aboriginal title for Gitxsan within the KUG Project area. Based on information available to the Province and additional information provided by Gitxsan, EAO restated that EAO's initial assessment is that there is a moderate *prima facie* claim to Gitxsan Aboriginal rights in the area of the potential downstream impacts from the KUG Project to Attichika Creek. EAO reiterated that to meet its duty to consult, EAO will provide Gitxsan with notification of key milestones of the EA, keep them informed of the progress of the EA, and provide the opportunity to raise any issues to EAO for discussion. EAO also offered to arrange a meeting with Gitxsan.

During the Application Review stage, EAO offered $12,300 in capacity funding to Gitxsan, on behalf of the Agency for the substituted EA, to assist with the costs associated with their participation in the Application review stage of the EA. Gitxsan accepted the offer of capacity funding and confirmed their interest in participating in the remainder of the EA. This capacity funding was provided to Gitxsan in May 2016.

EAO and the MMPO of MEM, met with Gitxsan on June 20, 2016, September 16, 2016 and December 12, 2016 (the latter by teleconference). AuRico also attended the meeting on September 16, 2016. During discussions, Gitxsan restated its concern that EAO's assessment of the duty to consult did not consider the "Gitxsan Territory" boundary map and noted where the *wilp* Nii Kyap territory overlaps with the KUG Project. Gitxsan informed AuRico about their interest in obtaining environmental jobs and being involved in fish and wildlife monitoring programs and reclamation of the KUG Project; and requested a site visit and helicopter tour, and a meeting with AuRico. Responses to these issues and interests are described in the "Potential Impacts of the

KUG Project to Gitxsan's Aboriginal Interests" section below. During the December 12th meeting Gitxsan and EAO discussed the Gitxsan sections of EAO's draft consultation report that was sent to Gitxsan for review. Gitxsan outlined a number of steps they felt were needed prior to completion of their review of the KUG Project, including additional meetings with EAO, AuRico and meeting with other First Nations on Schedule C of the Section 11 Order. EAO did not receive any specific comments from Gitxsan on EAO's draft consultation report. EAO received comments from Gitxsan during the public comment period on the draft Assessment Report and draft conditions of an EAC and draft federal conditions of a Decision Statement. These issues are discussed in section 12.1.4.

12.1.4 Potential Impacts of the KUG Project to Gitxsan's Aboriginal Interests

Key issues raised by Gitxsan in relation to its Aboriginal Interests included potential impacts to:

- Water quality, drinking water, watercourses and fish;
- Socially and spiritually significant sites; and
- Title including from trespass on Gitxsan lands.

Concerns raised by Gitxsan related to the KUG Project and the EA include:

- Safety concerns related to underground mining; and
- Inadequate funding for participation in the EA; and
- Consideration of Gitxsan land use plan.

Other Interests expressed by Gitxsan:

- Interest in environmental jobs;
- Reclamation of KS;
- Partnership agreements and revenue transformation;
- Meetings with other First Nations;
- Involvement in fish and wildlife monitoring programs and reclamation of the KUG Project; and
- Site visit and meeting with AuRico.

<u>Impacts from the KUG Project on water quality, drinking water, watercourses, and fish</u>

Gitxsan expressed concerns regarding the impacts on water quality from KS and potential additional impacts from mineral exploration and the KUG Project, including underground workings. Gitxsan were concerned water quality effects could impact drinking water and fish habitat. They also inquired if water is tested in Thutade Lake.

EAO responded that AuRico has water quality monitoring stations on Thutade Lake. In addition, Gitxsan expressed the view that compensation should occur for the loss of fish habitat related to road development. EAO considers that effects from the KUG Project on water quality, fish and aquatic habitat would be addressed by the proposed EAC conditions, permitting requirements and existing legislation, and as such, compensation is unnecessary. These EAC conditions include the requirement for AuRico to treat the effluent from the KUG Project TSF for metals and Se to meet BC WQG or SBEB, a water quality monitoring plan for Amazay Lake including surface water quality monitoring and groundwater monitoring to detect potential groundwater movement from the underground workings towards Amazay Lake, a fish and aquatic effects monitoring plan to monitor concentrations of bio-accumulative contaminants in fish in Thutade Lake and a requirement that AuRico monitor and mitigate any observed adverse effects of the IDZ on fish habitat use. EAO notes that requirements for forest service roads (such as the ORAR) including maintaining stream crossings and protecting fish and fish habitat are addressed by the Forest Planning and Practices Regulation under the *Forest and Range Practices Act*. No new roads would be constructed for the KUG Project that affect fish habitat.

In consideration of the information available to EAO, AuRico's proposed mitigation measures, proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects on water, fish and aquatic habitat and effects of the KUG Project on Aboriginal peoples' CULRTP – as discussed in sections 3.3.3, 3.4.3 and 10.3.3 of this Assessment Report – the KUG Project is expected to have negligible impacts on Gitxsan's asserted Aboriginal right to fish in the area of the KUG Project.

Impacts from the KUG Project on socially and spiritually significant sites

Gitxsan identified Amazay Lake and Thutade Lake as socially and spiritually significant sites. The Application states that "Thutade Lake is reported to be the site of a historical territorial conflict between the Tse'khene and the Gitxsan, and associated locations along the lake include the place where the Tse'khene were camped at the time of a battle, the location of the battle, and an associated burial (Littlefield, Dorricott, and Cullon 2007). These places are important to both the TKN and *wilp* Nii Kyap. The button blanket belonging to the Chief of *wilp* Nii Kyap commemorates the peace settlement that was made following the battle (Daly 2013). It is a physical heritage object that is directly related to the LSA."

The Application concludes that the symbolism of the button blanket would not be affected by the KUG Project since no changes are anticipated to the physical geography or water quality of Thutade Lake, Amazay Lake or Cascadero Falls. Additionally these

areas are outside of the restricted access area around the mine site (see Figure 13 in section 10.3.5 of this report). Therefore AuRico does not anticipate effects to sacred objects associated with these locations.

In consideration of the information available to EAO, AuRico's proposed mitigation measures, proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects on heritage and effects of the KUG Project on Aboriginal peoples' physical and cultural heritage, and effects on historical, archaeological, paleontological or architectural sites or structures – as discussed in sections 6.1.3 and 10.3.2 of this Assessment Report – the KUG Project is expected to have negligible impacts on Gitxsan's culturally important sites in the area of the KUG Project.

Impacts from the KUG Project on title

During meetings with AuRico and EAO, Gitxsan claimed interests in the KUG Project area including Aboriginal title. Based on the KN Joint Review Panel in 2007, Gitxsan noted their interests include historic and contemporary land tenure, as well as resource management and governance, and that the KUG Project is located in the *Gawa Gyaani* (peace treaty) area, where rights are shared based on family connections, though ultimately held by the House Chief for communal benefit of the *wilp*.

EAO reviewed available information, including the affidavit describing the Nii Kyap Tutadi (Thutade) territory prepared for the *Delgamuukw* Supreme Court Decision trial and note that the latter describes the eastern boundary of the territory in the vicinity of the KUG Project as extending east of the height of land next to the Niven river northward to the northeast end of the Tutadi (Thutade) Lake. EAO understands this to exclude Amazay Lake and the KUG Project. EAO does not have any specific information that describes Gitxsan use or occupancy of the KUG Project area.

During the June 2016 meeting, Gitxsan expressed to EAO and MMPO that government has trespassed on Gitxsan land. Gitxsan's own people would assess the value of being on their land and provide payment for being on the land. Gitxsan suggested EAO and MMPO make Gitxsan an offer for that trespass, but cautioned EAO and MMPO not to embarrass the land owners with the offer.

EAO acknowledged Gitxsan's view of land trespass and noted that the Province has a different view. The purpose of consultation is for the Crown to understand and appropriately address impacts flowing from the specific proposal at issue. As EAO had stated, its interest is in understanding Gitxsan's use of the KUG Project area in order to inform the Crown's assessment of Gitxsan's Aboriginal Interests, the nature of any

potential adverse effect to those Aboriginal Interests arising from the KUG Project, and to address those impacts as appropriate.

Given EAO's understanding of Gtixsan's use or occupancy of the KUG Project area, in EAO's opinion, the KUG Project is not expected to impact on Gitxsan's asserted Aboriginal title to the KUG Project area.

Safety concerns related to underground mining

Gitxsan raised concerns of worker safety related to underground mining including health effects of air quality for underground workers. EAO responded that underground mining is regulated under the Health, Safety and Reclamation Code for Mines in BC.

Inadequate funding for participation in the EA

Gitxsan expressed the view that the $12,300 in capacity funding was inadequate for the purposes of participating in the KUG Project EA. They noted that the funding provided by some Liquefied Natural Gas companies for other projects was much greater and that Gitxsan had expended approximately $500,000 in responding to the KN project proposal and had not been reimbursed. EAO responded that this funding, provided by the Agency, is what is available for Aboriginal Groups on Schedule C of the Section 11 Order and no more funds were available to engage on the KUG Project EA. In EAO's view the amount of capacity funding is reasonable for Schedule C First Nations, including Gitxsan, given the nature of the potential impact of the KUG Project on Gitxsan's Aboriginal Interests.

Consideration of Gitxsan Land Use Plan

Gitxsan indicated to EAO that they would like consideration of the Gitxsan Land Use Plan in the EA for the KUG Project. EAO could not find the plan on publicly available sources. EAO requested the plan on a number of occasions from Gitxsan, but Gitxsan did not provide it to EAO.

Reclamation of KS

Gitxsan expressed concern relating to the reclamation of KS, specifically noting that a slide occurred on a wall of the pit (the proposed KUG Project TSF) and that the KS pit required reclamation. In the September 16, 2016 meeting, AuRico described the reclamation activities related to KS and the circumstances related to the slide. AuRico indicated that it had completed all reclamation of KS possible, with the exception of

areas required for the KUG Project, including the buildings (mill, service complex, camp and their associated footprints) and minesite roads. AuRico stated these remaining areas would be reclaimed at the end of the KUG Project or earlier if the KUG Project was not approved. AuRico stated that the slide on the wall of the KS pit occurred near the end of the KS ore extraction on the west side of the pit and the remainder of mining operations (i.e., ore extraction) occurred on the east side of the pit. Therefore, it was not an operational safety issue and did not interfere with ore extraction for the remainder of the mine life. AuRico did not identify any environmental effects resulting from this slide since it was contained within the KS pit. The KS pit would be used as the KUG Project TSF and would be subject to additional reclamation activities during closure of the KUG Project to reduce erosion potential on and adjacent to the KUG Project TSF, to ensure adequate quality of discharge water and to establish native vegetation on the downstream slope of the east dam.

Partnership agreements and revenue transformation

EAO understands that Gitxsan has interest in partnership agreements and revenue transformation relating to the KUG Project, but did not receive any details from Gitxsan about these interests.

Meetings with other First Nations

EAO understands that Gitxsan places a high priority on meeting with other First Nations impacted by the KUG Project. EAO indicated to Gitxsan that they typically meet with the individual First Nations in relation to the assessment of impacts from a project on the First Nation's Aboriginal Interests. The list of Aboriginal groups potentially impacted by the KUG Project is listed in the Section 11 Order issued on May 2014. EAO noted that Gitxsan was welcome to try to arrange such a meeting.

Interest in environmental jobs and involvement in fish and wildlife monitoring, and reclamation of the KUG Project

Gitxsan expressed an interest in environmental jobs at the KUG Project and specifically involvement in fish and wildlife monitoring and reclamation activities. EAO committed to share this interest with AuRico and followed up directly with AuRico to convey the information. Additionally, EAO scheduled a follow up meeting with Gitxsan, EAO and AuRico on September 16, 2016 where these interests were discussed with AuRico. During the meeting, Gitxsan expressed an interest in obtaining employment for the KUG Project and in viewing the reclaimed KS. AuRico noted that job opportunities would

become available when construction started. AuRico committed to provide Gitxsan with a list of job opportunities at the KUG Project and required skill sets when available.

Site visit and meeting with AuRico

Gitxsan expressed an interest in going on a site visit of the KUG Project and meeting with AuRico. EAO scheduled a follow up meeting with Gitxsan, EAO and AuRico on September 16, 2016 where this interest was discussed with AuRico. AuRico noted that tours of the KUG Project have been offered in the past to Gitxsan and could be offered again when scheduled.

Conclusion

Based on the analysis presented above, and taking into consideration the residual adverse effects from the KUG Project and proposed conditions including the requirement for AuRico to treat the effluent from the TSF for metals and Se to meet WQG or SBEB, a surface water quality and groundwater quality monitoring plan for Amazay Lake and a fish and aquatic effects monitoring plan to monitor concentrations of bio-accumulative contaminants in fish in Thutade Lake, and limited detail about Gitxsan's area of traditional use and or occupancy within the KUG Project area, EAO concludes that the KUG Project is not expected to impact Gitxsan's Aboriginal Interests, including culturally significant sites identified at Amazay Lake and Thutade Lake.

12.2 Treaty 8 First Nations of BC

12.2.1 Context

- WMFN, SFN, MLIB, BRFN, DRFN, FNFN, HRFN, and PRFN (Treaty 8 First Nations) are signatories to Treaty 8, which secures treaty First Nations the right to hunt, fish and trap within the treaty area, subject to the terms of the treaty, including the right of the Crown to "take up" lands for various purposes.
- The treaty right to hunt, fish and trap and the ancillary activities associated with carrying out these rights are recognized and affirmed by Section 35 rights of the *Constitution Act*, 1982.
- Through Treaty 8, the Crown has the right to "take up" lands for settlement, mining, lumbering, trading, or other purposes. As stated by the Supreme Court of Canada in *Mikisew Cree First Nation v. British Columbia* (SCC 2005), with the general principle recently reaffirmed in Grassy Narrows First Nations v. Ontario (SCC, 2014), the Crown's right to take up lands under Treaty 8 is subject to the duty to consult and, as appropriate, accommodate the Treaty 8 Aboriginal group's rights before reducing the

area over which their members may continue to pursue hunting, trapping, and fishing rights. Although all Treaty 8 First Nations are entitled to engage in hunting, fishing, and trapping activities within the whole of the Treaty 8 area (extending across northern Alberta into the Norwest Territories and Saskatchewan), in accordance with the terms of the treaty, where a Treaty 8 First Nation no longer has a meaningful right to hunt, trap or fish in relation to the territory over which it traditionally hunted, trapped or fished, this may result in a treaty infringement.

12.2.2 Aboriginal Interests and EAO's Assessment of KUG Project Impacts and Depth of Consultation

- The KUG Project is within an area which is subject to ongoing litigation with the Province regarding the location of the western boundary of Treaty 8 territory (identified in Figure 21.1-1 in the Application).
- The Crown understands that all Treaty 8 First Nations hold rights throughout the Treaty 8 territory.
- The KUG Project is within a preferred territory identified by WMFN. The Application states that none of the publicly available information sources indicate WMFN resources harvesting areas in the LSA or RSA for AuRico's assessment of the "effects of changes to the environment on Aboriginal peoples". The community is approximately 615 km by road southeast of the KUG Project.
- HRFN informed AuRico that there is current traditional use information that HRFN ancestors have history in the KUG Project area and there are known traditional use sites within 60 km of the KUG Project. The HRFN community is approximately 300 km from the KUG Project.
- The other Treaty 8 First Nation communities in BC are also located a substantial distance from the KUG Project, and the Application notes that a review of publicly available information has not identified historic or current use by these Treaty 8 First Nations in the LSA or RSA. Figure 21.1-1 in the Application shows the location of each of the Treaty 8 First Nation communities in relation to the KUG Project:
    - The DRFN community is located approximately 770 km by road east of the KUG Project;
    - The PRFN community is located about 1,000 km by road, northeast of the KUG Project;
    - The SFN community is located approximately 600 km by road from the KUG Project.
    - The FNFN community is approximately 1,100 km by road, northeast of the KUG Project.
    - The BRFN community is located about 780 km by road, east of the KUG Project.

    - The MLIB territorial boundary is located approximately 450 km by road, east of the KUG Project.
- Because of the distance of the HRFN community (and most other Treaty 8 First Nations' communities) from the KUG Project site, EAO anticipates there would be a limited potential for impacts from the KUG Project on HRFN's and the other Treaty First Nations.
- Given the location of the KUG Project and EAO's assessment of the potential impacts to the Treaty 8 First Nations' Aboriginal interests, including Treaty 8 rights, EAO's view is that the duty to consult each of the Treaty 8 First Nations in BC lies at the low end of the *Haida* spectrum. Consistent with this level of consultation, EAO provided these Treaty 8 First Nations with notifications of key milestones during the EA review process, and the opportunity to comment on the draft Assessment Report and EAO's draft consultation report (Part C of this report). The Treaty 8 First Nations consulted are listed on Schedule C of the Section 11 Order.

12.2.3 Summary of Consultation

EAO provided each Treaty 8 First Nations with notification of key milestones for the KUG Project such as the issuance of the AIR, Section 11 and 13 orders, acceptance of the Application for review and timing of public comment periods. EAO also provided an opportunity to review and provide comments on the draft Assessment Report which includes draft conditions for an EAC, and EAO's consultation report. Treaty 8 First Nations also have the opportunity to comment on draft federal conditions for a Decision Statement during the public consultation period on the draft Assessment Report. In addition, EAO has offered to meet directly with Treaty 8 First Nations to discuss the EA.

To date, no issues or concerns have been raised by WMFN, SFN, MLIB, BRFN, FNFN, or PRFN.

In an email dated May 27, 2016, FNFN indicated they would not be participating in the EA stating they support the position of the Treaty 8 First Nations most affected by the KUG Project.

AuRico sent letters by email to Treaty 8 First Nations in March 2015 to introduce the KUG Project, to provide an overview of the EA, and describe the process for collecting information and assessing potential effects in accordance with CEAA 2012 (5)(1)(c).

DRFN responded by email requesting further information about the KUG Project and inquired about potential employment opportunities and a site visit. AuRico responded

and provided the requested information and offered a site visit, although DRFN did not participate in a site visit.

During the pre-Application stage of the EA, AuRico communicated with the Treaty 8 First Nations and provided draft reports for each Treaty 8 First Nation for review and comment. The draft reports described AuRico's understanding of each First Nation's history, CULRTP, health and socio-economic conditions and physical and cultural heritage. The reports were developed to support the assessment of the effects of environmental changes caused by the KUG Project on the Treaty 8 First Nations in accordance with CEAA 2012 (5)(1)(c). AuRico also requested Treaty 8 First Nations provide further information about the use of the KUG Project area.

HRFN responded to AuRico and requested AuRico undertake a robust approach to tailings safety and consider the potential impacts to the Peace River watershed in the event of a TSF breach. HRFN also inquired about potential procurement and employment opportunities, and suggested AuRico use Halfway River Ventures to procure machinery or personnel for the KUG Project. AuRico responded to HRFN's concern that a breach of the KUG Project's water or TSF would have downstream effects on the Peace River watershed. AuRico noted that the TSF would be built in accordance with the Canadian Dam Association's Dam Safety Guidelines (2007, 2013) to the highest and most stringent criteria. AuRico indicated it was receptive to receiving an expression of interest regarding business opportunities from HRFN; although none was received.

Later in the pre-Application stage, AuRico provided another draft report to all BC-based Treaty 8 First Nations describing the assessment of potential effects of environmental change caused by the KUG Project on each group, in accordance with CEAA 2012 (5)(1)(c), for review and comment. No comments were received.

Prior to submission of the Application, AuRico wrote to the Treaty 8 First Nations notifying them of the intended submission and opportunity to comment during EAO's public comment period. No comments were received.

On April 28, 2016, EAO offered $12,300 in capacity funding to each of the BC-based Treaty 8 First Nations, on behalf of the Agency, to support Aboriginal consultation during the Application review stage of the substituted EA. DRFN and HRFN, accepted the offer of capacity funding and confirmed their interest in participating in the Application review stage of the EA. EAO provided this capacity funding to HRFN in May 2016 and DRFN in June 2016. In an email dated May 27, 2016, FNFN declined the offer of capacity funding and confirmed they would not be participating in the EA. EAO did

not receive a response from WMFN, SFN, MLIB, BRFN, or PRFN, despite several efforts at communication.

During the Application review, only one Treaty 8 First Nation, HRFN submitted comments on the Application. AuRico responded to HRFN's comments which are documented in an issues tracking table which is posted to EPIC. EAO's assessment of potential impacts to HRFN Aboriginal Interests, including Treaty 8 rights are discussed below.

12.2.4 Potential Impacts of the KUG Project to Treaty 8 First Nation's Aboriginal Interests

During Application review, HRFN raised concerns about the KUG Project regarding the following subjects:

- potential impacts to water quality, fish and aquatic habitat and compensation efforts;
- wildlife habitat loss and fragmentation;
- harvestable plants;
- inadequate data collection and characterization of wetland function;
- cumulative effects assessment; and
- inadequate consultation with HRFN.

A complete list of HRFN's comments and AuRico's detailed responses are documented in an issues tracking table posted to EPIC. A brief summary of AuRico and EAO's responses, including proposed conditions to address HRFN's concerns, are documented below.

<u>Fishing: Potential impacts to water quality, fish and aquatic habitat and compensation efforts</u>

Water Quality

HRFN raised the concern that during operations there would be release of contaminants (increased levels of Se, Cu and N to surrounding surface waters and groundwater aquifers, resulting in adverse impacts to fish and wildlife and potentially contributing to increased contamination of the Williston Reservoir and Peace River. AuRico responded that potential water quality effects from the KUG Project were considered in project planning and the effects assessment. AuRico stated that they considered impacts of all the project design features on water quality, and fish and fish habitat. AuRico predicts

that water quality effects would be limited to tributaries of Attichika Creek and Attycelley Creek and does not anticipate that the KUG Project would interact with the Williston Reservoir or the Peace River. The combined drainage area of Attichika Creek and Attycelley Creek makes up less than 1% of the drainage area of Williston Reservoir; therefore AuRico predicts water quality effects would be negligible that far downstream. AuRico concluded that wildlife effects related to the project effects on water quality are considered negligible.

EAO concurs that water quality effects are not anticipated to occur to the Williston Reservoir and Peace River. Further details on EAO's analysis of potential effects to water quality and fish and aquatic habitat from the KUG Project are described in Part B, sections 3.3 and 3.4, respectively, of this report.

EAO proposed the following EAC conditions, which would address potential impacts to water quality including:

- Requirement for AuRico to treat the effluent from the TSF for metals and Se to meet WQG or SBEB;
- Requirement for AuRico to ensure that Se concentrations of the discharge to Waste Rock Creek from the TSF during post-closure would not incrementally affect Se concentrations in Waste Rock Creek;
- A water quality monitoring plan for Amazay Lake and a groundwater monitoring plan to detect potential groundwater movement from the underground workings towards Amazay Lake to be developed by a QP; and
- A Fish and Aquatic Effects Monitoring Plan requiring monitoring of concentrations of bio-accumulative contaminants in bull trout in Thutade Lake.

Considering these conditions, which would be legally binding as a schedule to the EAC, EAO is satisfied that the KUG Project is not anticipated to have significant adverse effects to water quality.

Fish and aquatic habitat and compensation efforts

HRFN requested that AuRico describe compensation efforts to improve fish habitat and local fisheries as required, and efforts in light of the failure of Waste Rock Creek to support healthy fish populations. AuRico responded that fish habitat was compensated for from Kemess South, with a salvage and transplant of the upper Waste Rock Creek fish population to a previously barren inlet stream (Diagonal Mountain Creek) to Thutade Lake.

EAO proposed EAC conditions requiring a Fish and Aquatic Effects Monitoring Plan, requiring AuRico to ensure that discharge to Waste Rock Creek from the TSF during post-closure would not incrementally increase Se concentrations in Waste Rock Creek, and an IDZ Management Plan that would require AuRico to implement mitigation measures for observed adverse effects of the IDZ on fish habitat use in Attichika Creek. Considering these plans and the analysis presented in section 3.4, EAO does not predict significant adverse effects to fish or aquatic habitat from the KUG Project.

Conclusion

In consideration of the information available to EAO, AuRico's proposed mitigation measures, proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects on water, fish and aquatic habitat and Aboriginal peoples' CULRTP – as discussed in sections 3.3.3, 3.4.3 and 10.3.3 of this Assessment Report – the KUG Project is expected to have negligible impacts on HRFN's Treaty 8 right to fish.

Hunting: Wildlife habitat loss and fragmentation

HRFN raised concerns that increased habitat fragmentation and loss of wildlife habitat (loss of vegetation forested communities, such as old growth forests, which support wildlife), would result in impacts to moose and caribou which HRFN rely on for food and clothing accessories. AuRico acknowledges there is potential habitat loss and alteration of wildlife habitat, including the proposed Thutade caribou herd and moose habitat, which could occur as a result of vegetation clearing during construction and subsidence during operations. AuRico proposed avoidance of important habitat during final project infrastructure siting, and revegetation/reclamation beginning prior to closure, as mitigation measures for habitat loss and alteration.

EAO proposes an EAC condition for a Wildlife Management and Monitoring Plan to mitigate potential effects to wildlife. Among other requirements, this plan would need to reflect FLNRO guidance regarding the protection of sensitive wildlife areas for ungulates, include measures to reduce attractants of roadside vegetation to moose and include a caribou management and monitoring plan as a component plan. EAO is also proposing a condition requiring AuRico to enter into an agreement with FLNRO that would set out the terms of AuRico's participation in a program of activities that supports the conservation and management of caribou in the KUG Project area. The agreement may require AuRico to contribute up to $30,000 toward the cost of implementing the program. Considering the analysis presented in section 3.5 of this report and the above conditions related to caribou, which would be legally binding as a schedule of the EAC, if issued, EAO concluded that due to the low amount of habitat loss relative to what is

available to caribou and moose in the regional context, habitat loss and alteration is not predicted to result in a significant adverse residual or cumulative effect on caribou and moose.

In consideration of the information available to EAO, AuRico's proposed mitigation measures, proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects on wildlife and wildlife habitat and Aboriginal peoples' CULRTP – as discussed in sections 3.5.3 and 10.3.3 of this Assessment Report – the KUG Project is expected to have negligible impacts on HRFN's Treaty 8 right to hunt.

Gathering: Assessment on harvestable plant species

HRFN indicated that AuRico should have completed a more thorough assessment of the abundance and distribution of harvestable plants. AuRico acknowledged that the complete and comprehensive list of harvestable plants in the LSA was not available at the time the Application was prepared. However, AuRico considered potential effects of the KUG Project on multiple ecosystem VCs that likely contain harvestable plants and considered the proposed mitigation measures (e.g., to avoid and minimize dust, erosion, spread of invasive plants, and changes to hydrology) as adequate to avoid residual effects to harvestable plants.

AuRico also indicated that potential effects to resource harvesting, including access to harvesting areas and environmental effects on plants and vegetation, were considered as part of the Assessment of Aboriginal Interests (Application, Chapter 21).

Although EAO sought feedback from HRFN on the adequacy of AuRico's responses to their comments and HRFN did not respond.

EAO did not concur with AuRico's characterization of no residual effects to harvestable plants. AuRico identified the loss of 39.6 ha and the alteration of 170.6 ha harvestable plant habitat. The mitigation measures identified by AuRico such as dust suppression or controlling invasive plants would not be sufficient to prevent impacts to harvestable plants in areas such as the subsidence zone, roads or areas of mine infrastructure footprint. Furthermore, residual impacts to alpine and parkland and forested ecosystems, while not significant, were long-term in some cases and the KUG Project could end up impacting certain species of harvestable plants, depending on their distribution.

EAO requested further information from AuRico to characterize residual effects to harvestable plants and this information is presented in section 3.6 of this report. EAO does not predict effects to harvestable plants from the KUG Project would be significant

considering these effects are anticipated to be of low magnitude, localized extent and reversible. In addition, EAO proposes an EAC condition for an Ecosystems Management Plan that would include evaluating the effectiveness of re-vegetation with the identification of additional mitigations if required.

In consideration of the information available to EAO, AuRico's proposed mitigation measures, proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects on terrestrial ecosystems and Aboriginal peoples' CULRTP – as discussed in sections 3.6.3 and 10.3.3 of this Assessment Report – the KUG Project is expected to have negligible impacts on HRFN's gathering activities.

Inadequate data collection and characterization of wetland function

HFRN requested that AuRico provide a rationale as to why wetland function and condition was not assessed during baseline studies. AuRico responded that residual effects to wetlands were considered negligible because of the limited area expected to be either lost or altered and application mitigation measures: avoidance to minimize project effects to wetlands (the route for the discharge line for example was re-designed to avoid most wetlands). AuRico stated that the loss of wetlands and effects to wetland function due to the KUG Project were not considered residual because of the very small area of loss (0.2 ha) and limited alteration of wetland functions.

EAO proposes an EAC condition requiring an Ecosystems Management Plan including wetlands monitoring and mitigation to ensure that effects to wetlands are minimized and adaptive management occurs if additional effects are observed. With the application of this plan and considering the small area of the wetlands impacted by the KUG Project, EAO is of the view that residual impacts to wetlands from the KUG Project are not expected.

Cumulative effects assessment

HRFN raised the concern about AuRico's cumulative effects assessment on VCs of importance to HRFN, such as forested ecosystems, fish, moose, and water quality. AuRico acknowledges that the KUG Project would contribute to the cumulative effects associated with past producing KS. KS facilities were incorporated into the water balance and water quality models to inform the hydrology and water quality effects assessment, and all VCs which interact cumulatively with KS. AuRico did consider two additional past projects and two foreseeable future projects. Table 8.7-1 in the Application identifies past, present and foreseeable future activities that may cumulatively interact with the KUG Project. AuRico did not anticipate any potential interactions leading to cumulative effect with surface water quantity or fish and fish

habitat. HRFN disagrees with AuRico's conclusion of no cumulative adverse residual impacts on wildlife. AuRico explained that project related disruption of wildlife movement is not considered a cumulative effect, as the disruption of movement due to habitat loss and alteration form other projects and activities in the region would be minimal, as the habitat loss only represents 0.27% of the RSA and habitat alteration represents 4% of the RSA.

EAO did not concur with AuRico's assessment of cumulative effects for wildlife or water quality. For water, EAO proposed a condition to ensure that there would be no adverse incremental effects of Se in Waste Rock Creek from the discharge of the TSF into Waste Rock Creek during post-closure. For wildlife, EAO concluded that cumulative effects from forestry, KS and other previous mines in the RSA, mineral exploration, transmission lines and roads in the RSA and the KUG Project would likely result in habitat loss and alteration and disruption to movement for a variety of wildlife species; however these effects are expected to occur in a small percentage of the RSA (less than 6%) which EAO considers to be low magnitude and therefore, would not be significant.

EAO proposes an EAC condition for a Wildlife Management and Monitoring Plan to address potential impacts to wildlife. In addition to the Se condition noted above, the other EAC conditions listed above to address water quality impacts would also mitigate cumulative effects to water quality.

Inadequate Consultation

HRFN expressed the view that AuRico inadequately consulted with HRFN on potential socio-economic impacts and benefits of the KUG Project based on HRFN's historical use of the KUG Project area and the distance of the HRFN community from the KUG Project. Further, HRFN indicated they were not adequately consulted in the development of the heritage effects assessment and the identification of cultural and spiritual sites within the RSA or LSA. AuRico responded that the level of consultation with HRFN was delegated as set out in the Section 11 Order and guidance from EAO. EAO and AuRico's engagement with Treaty 8 First Nations, including HRFN, is described in the section "Consultation Summary" above. EAO is satisfied that the consultation efforts with HRFN by both AuRico and EAO have been reasonable and appropriate to the nature of the Aboriginal Interests and seriousness of potential impact to those Aboriginal Interests arising from the KUG Project.

Conclusion

In addition to considering the specific comments from HRFN and the potential impact to HRFN's Aboriginal Interests, EAO also considered the potential effects for those Treaty 8 First Nations who did not provide comments, and considered that the potential for effects on other Treaty 8 First Nations would be similar to those discussed for HRFN.

In consideration of the information available to EAO, AuRico's proposed mitigation measures, proposed conditions of any EAC issued, EAO's analysis of residual and cumulative effects from the KUG Project and the distance of the KUG Project to the Treaty 8 First Nations' known areas of traditional use, EAO concludes that the KUG Project is not expected to cause adverse impacts to Treaty 8 First Nations' treaty rights to hunt, trap and fish, nor are adverse effects expected to Treaty 8 First Nations' gathering activities (food and medicinal plants) or culturally important sites or trails.

12.3 Métis Nation BC (MNBC)

12.3.1 Context

- The MNBC do not claim a traditional territory, rather they assert rights and traditional uses throughout BC.
- There are seven MNBC regions which cover BC and provide organizational structure of the organization, and within the region, there are 35 Metis 'chartered communities'; consultation for the KUG Project was directed through MNBC.
- The KUG Project is located within MNBC's northwest BC region and the closest chartered communities are Smithers, Terrace, Prince George and Chetwynd.
- AuRico's Application states that "…historically, the Metis's livelihood came from subsistence harvesting based on seasonal round and commercial production of furs, fish and game. Mobility of the Métis people was the foundation of their harvesting traditions. Harvesters used and occupied a vast area with their families according to seasonal round directed by the availability of resources". Traditionally, the Métis harvested large and small mammals, game birds as well as waterfowl from rivers and lakes, fish, and berries and other plant foods.
- To meet federal consultation agreements consistent with the MOU, EAO notified the Métis (represented by MNBC) of key milestones during the EA.

12.3.2 Traditional Land Uses and EAO's Assessment of KUG Project Impacts and Depth of Consultation

- No Métis rights-bearing community in BC has been recognized by a court. The Province of BC does not recognize a legal obligation to consult with Métis people as it is of the view that no Métis community is capable of successfully asserting

site-specific section 35 rights in BC. Consultation activities conducted by EAO in relation to the KUG Project were done on behalf of the Government of Canada.

- MNBC may have interests in the KUG Project area; therefore to meet federal consultation agreements consistent with the MOU, MNBC was included on Schedule C and consulted at the low end of the *Haida* Spectrum.
- MNBC provided AuRico with their UOS, which includes information on historic, current and potential future resource harvesting and cultural activities in a "buffer zone", which is within 200 km of the KUG Project.
- Beyond the information from the UOS presented in the Application, and comment submitted during the final public comment period, EAO did not receive any additional information directly from MNBC regarding Metis traditional land uses in the KUG Project area or whether there may be potential impacts from the KUG Project on Metis' traditional land uses.

12.3.3 Summary of Consultation

EAO provided MNBC with notification of key milestones for the KUG Project such as the issuance of the AIR, Section 11 and 13 orders, acceptance of the Application for review and timing of public comment periods. EAO also provided an opportunity to review and provide comments on the draft Assessment Report which includes draft conditions for an EAC, and EAO's draft consultation report (Part C of this report). MNBC also had the opportunity to comment on draft federal conditions for a Decision Statement during the public consultation period on the draft Assessment Report. In addition, EAO has offered to meet directly with MNBC to discuss the EA.

AuRico corresponded with MNBC in March 2015 to introduce the KUG Project, provide an overview of the EA, and describe the process for collecting information and assessing potential effects in accordance with CEAA 2012 (5)(1)(c). MNBC confirmed receipt of the email and forwarded the information to its natural resource department.

During the pre-Application stage of the EA, AuRico communicated with MNBC and provided a draft report to MNBC which described AuRico's understanding of MNBC's history, CULRTP, health and socio-economic conditions and physical and cultural heritage, for review and comment. The draft report was developed to support the assessment of the effects of environmental changes caused by the KUG Project on MNBC in accordance with CEAA 2012 (5)(1)(c). AuRico also requested MNBC provide further information about the use of the KUG Project area. AuRico met with MNBC's Director of Natural Resources to discuss MNBC's comments on the KUG Project, the draft report, and to draft a data sharing protocol with AuRico to access MNBC's database. Shortly thereafter, AuRico signed the data sharing protocol. MNBC

responded to AuRico, provided information about harvesting and traditional knowledge, and a copy of the MNBC's Métis UOS.

Later in the pre-Application stage, AuRico provided another draft report describing the assessment of potential effects of environmental change caused by the KUG Project on MNBC, in accordance with CEAA 2012 (5)(1)(c), for review and comment. No comments were received.

Prior to submission of the Application, AuRico wrote to MNBC notifying them of the intended submission and inviting comments. No comments were received.

On April 28, 2016, EAO offered $12,300 in capacity funding to MNBC, on behalf of the Agency, to support Aboriginal consultation during the Application review stage of the substituted EA. MNBC accepted the offer of capacity funding and confirmed their interest in participating in the Application review stage of the EA. This capacity funding was provided to MNBC in June 2016.

EAO received comments from MNBC during the public comment period on the draft Assessment Report and draft conditions of an EAC and draft federal conditions of a Decision Statement. These issues are discussed below in section 12.3.4. MNBC did not provide any specific information about traditional land uses in the KUG Project area to EAO.

12.3.4 Potential Impacts of the KUG Project to Métis Traditional Land Uses

MNBC has informed EAO that despite the KUG Project having the potential to impact soil, water, fish, wildlife, scenic diversity and other natural resources, MNBC concurs with the draft of this report that the KUG Project would not cause significant adverse impacts to air quality, water quality, greenhouse gas emissions or wildlife resources. . EAO is also aware of the information presented in the Application from the UOS.

Key issues raised by MNBC in relation to its traditional land uses included potential impacts to:

- Effects on Waste Rock Creek from Se;
- Wildlife resources;
- Other biophysical effects; and
- Impacts to Métis traditional land uses.

<u>Effects on Waste Rock Creek from Selenium</u>

MNBC expressed concerns that the draft Assessment Report poorly addressed the need to monitor Waste Rock Creek for Se levels although noted that this was specified in the federal conditions. EAO has proposed an EAC condition that would require AuRico to ensure that Se concentrations of the discharge to Waste Rock Creek from the KUG Project TSF during post-closure would not incrementally increase Se concentrations in Waste Rock Creek. EAO notes that the Environmental Monitoring Committee, as proposed in an EAC condition would discuss closure planning and water management and water quality monitoring and that water quality monitoring would also be addressed through EMA permits. Further discussion regarding the potential impacts on water, including, proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects on water, is captured in section 3.3.3 of this report.

Wildlife Resources

MNBC indicated its view that wildlife resources are not likely to be significantly impacted. MNBC expressed concern that the KUG Project could result in increased environmental concentrations of COPCs, which may accumulate through soils and water to wildlife (e.g., moose) and fish. MNBC was of the view that this issue was inadequately addressed in the Assessment Report. MNBC stated that monitoring and assessing of chemical hazards may need to be added to the provincial and federal conditions. EAO did not predict a residual adverse effect to wildlife from COPCs or to human health from the KUG Project (which included consideration of country foods). However, EAO recommends a follow-up program including monitoring to verify AuRico's predictions in the EA and track any potential increases in COPC concentrations in the environment and inform additional mitigation (which could include monitoring of wildlife species), if necessary, in order to satisfy the requirements of CEAA 2012 with respect to avoiding adverse environmental effects of the KUG Project on Aboriginal health. EAO also proposed a Fish and Aquatic Effects Monitoring Plan requiring AuRico to monitor concentrations of bioaccumulative contaminants in bull trout in Thutade Lake. AuRico would also be required to develop a Fish and Aquatic Effects Monitoring Plan duirng permitting. Further discussion regarding the potential impacts on wildlife, including, proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects on wildlife and human health, is captured in sections 3.5 and 5 of this Assessment Report.

Other Biophysical Effects

MNBC raised the concern that KUG Project has the potential to impact biological diversity, soil, water, fish, scenic diversity and other natural resources. However, they

further noted that, with the exception of the issue around Se in Waste Rock Creek and chemical risks to wildlife, they concurred with EAO that the KUG Project is not likely to cause significant adverse impacts to air quality, water quality or greenhouse gases. They further indicated that they viewed the proposed conditions to address COPC contamination of fish to be adequate to address potential fisheries impacts. MNBC did not provide further details on their view of impacts to biological or scenic diversity.

Potential impacts to aspects of biological diversity were addressed in the wildlife (for wildlife species) and terrestrial environment effects (for plant species and ecosystems) analyses. In consideration of AuRico's proposed mitigation measures, proposed conditions of any EAC issued, EAO predicts that the KUG Project is not expected to have significant adverse effects on the terrestrial environment or wildlife.

EAO notes that there is no view of the mine from key areas for CULRTP, such as Thutade Lake, Amazay lake, and Attichika Creek up to its confluence with Waste Rock Creek. Viewers could see the mountain on the KUG Project deposit from Amazay Lake, but as the mine would be underground, no infrastructure or facilities would be visible. Views of the new access corridor would largely be screened by forest cover (and 900 m of it would be via an access tunnel and therefore not visible). EAO does not predict any residual effects to the quality of land experience from visual quality.

Impacts to Métis traditional land uses

MNBC expressed the view that the rights and traditional land uses of MNBC should be taken into consideration, and where possible the impacts to these rights and uses should be minimized and mitigated, during the KUG Project EA. EAO notes that the EA considered information regarding potential impacts on Métis traditional land uses through AuRico's use of the UOS in their Application, through opportunities offered by AuRico and EAO for MNBC to provide specific information about traditional use in the KUG Project area, and provide comments on the Application and this report.

In consideration of the information available to EAO, AuRico's proposed mitigation measures, proposed conditions of any EAC issued, and EAO's analysis of residual and cumulative effects, EAO concludes that the KUG Project is not expected to impact Metis traditional land uses.

PART D – CONCLUSIONS

13. Conclusions

Based on:

- Information contained in the Application and supplemental information provided during Application Review;
- AuRico's and EAO's efforts at consultation with potentially affected Aboriginal groups, government agencies, and the public, and its commitment to ongoing consultation;
- EAO's collaborative approach to working with TKN to resolve project-specific issues, assess the potential adverse effects of the KUG Project on the Aboriginal title, rights, and interests of the TKN First Nations and seek consensus on proposed conditions and recommendations to Ministers;
- Comments on the KUG Project made by TKN and government agencies as members of EAO's Working Group, and AuRico's and EAO's responses to these comments;
- Comments received during the public comment periods, and AuRico and EAO's responses to these comments;
- Issues raised by TKN regarding potential impacts of the KUG Project and AuRico's responses and best efforts to address these issues;
- The design of the KUG Project as specified in the proposed Schedule A (CPD) of the EAC to be implemented by AuRico; and
- Mitigation measures identified as proposed conditions in Schedule B (TOC) of the EAC to be undertaken by the AuRico.

EAO is satisfied that:

- The EA has adequately identified and assessed the potential adverse environmental, economic, social, heritage and health effects of the KUG Project, having regard to the proposed conditions set out in Schedule B (TOC) to the EAC;
- Consultation with TKN, other Aboriginal groups, government agencies, and the public, which were within the scope of the EA, and the distribution of information about the KUG Project, has been adequately carried out by AuRico and that efforts to consult with TKN will continue;
- Issues identified by TKN, other Aboriginal groups, government agencies and the public, which were within the scope of the EA, were adequately and reasonably addressed by AuRico during Application Review;

- Practical means have been identified to prevent or reduce any potential adverse environmental, social, economic, heritage or health effects of the KUG Project such that no direct or indirect significant adverse effects is predicted or expected; and
- The provincial Crown has fulfilled its obligations for consultation and accommodations to potentially affected Aboriginal groups relating to the issuance of an EAC for the KUG Project.

In addition EAO notes that:

- TKN and EAO agree that the collaborative process has resulted in adequate mitigation and accommodation of the potential effects of the KUG Project on the Aboriginal title, rights, and interests of TKN First Nations at the EA stage.
- TKN has provided a letter of support to EAO for issuing the KUG Project an EAC and requested that the EAO convey this support to the Minister of the Environment and the Minister of Energy and Mines (the Ministers).

The Ministers will consider this Assessment Report, the Summary Assessment Report and other accompanying materials in making their decision on the issuance of an EAC to AuRico under the Act. This Assessment Report, the Summary Assessment Report and draft TOC will also be provided to the Agency for the federal Minister of Environment and Climate Change’s decision on the EA of the KUG Project.

Appendix 1: Characterization of Residual Effects

<table>
<tr><th rowspan="2">Characterization</th><th rowspan="2">General Description</th><th colspan="5">Effects Considered</th></tr>
<tr><th>GHG</th><th>Surface Water Quality</th><th>- Groundwater
- Fish and Aquatic Habitat
- Wildlife
- Terrestrial Environment

CEAA 2012: 5(1)(c)</th><th>Effects from Accidents and Malfunctions</th><th>Economic Effects</th></tr>
<tr><td>Context</td><td>Context (biophysical and economic effects): How sensitive or resilient the VC is to change caused by the KUG Project, given the context of existing conditions, cumulative effects and trends in the condition of the VC.
Context (effects from accidents): the ecological or social context of the VC, including whether it possesses unique attributes or plays an integral ecological or social role.
Resiliency (effects from accidents): How sensitive or resilient the VC is to change caused by the KUG Project, given the context of existing conditions, cumulative effects and trends in the condition of the VC.</td><td colspan="3">Low: the receiving environment or population has a low resilience to imposed stresses, and will not easily adapt to the effect.
Neutral: the receiving environment or population has a neutral resilience to imposed stresses and may be able to respond and adapt to the effect.
High: the receiving environment or population has a high natural resilience to imposed stresses, and can respond and adapt to the effect.</td><td>Context
Low: the component is considered to have little or no unique attributes.
Moderate: the component is considered to have some unique attributes.
High: the component is considered to be unique.

Resiliency
Low: the component is considered to be of low resiliency following the failure mode.
Moderate: the component is considered to be of moderate resiliency following the failure mode.
High: the component is considered to be highly resilient following the failure mode.</td><td>Low: the receiving environment or population has a low resilience to imposed stresses, and will not easily adapt to the effect.
Neutral: the receiving environment or population has a neutral resilience to imposed stresses and may be able to respond and adapt to the effect.
High: the receiving environment or population has a high natural resilience to imposed stresses, and can respond and adapt to the effect.</td></tr>
<tr><td>Magnitude</td><td>The expected size or severity of the residual effect. Considers the proportion of the VC affected within the spatial boundaries and the relative effect (e.g., relative to natural annual variation in the magnitude of the VC or other relevant characteristics).</td><td>The percentage of annual project emissions out of total GHG emissions reported in BC in 2014 (64,000,000 tonnes CO2e)
Negligible: <1 %
Low: 1-2 %
Medium: 2-5%
High: >5%</td><td>Low: greater than WQG and increases more than 10% over model background levels, but within the range of current variation.
Medium: greater than WQG, differ substantially from model background and near observed limits of current variation.
High: greater than WQG, differs substantially from model background levels, and detectable change beyond range of current variation.</td><td colspan="3">Negligible: no detectable change from baseline conditions
Low: differs from the average value for baseline conditions but remains within the range of natural variation and below a guideline or threshold value.
Medium: differs substantially from the average value for baseline conditions and approaches the limits of natural variation, but equal to or slightly above a guideline or threshold value.
High: differs substantially from baseline conditions and is significantly beyond a guideline or threshold value, resulting in a detectable change beyond the range of natural variation.</td></tr>
<tr><td>Extent</td><td>The spatial scale or extent over which the residual effect is expected to occur.</td><td colspan="3">Discrete: effect is limited to the Project area.
Local: effect is limited to the LSA.
Regional: effect occurs throughout the RSA.
Beyond regional: effect extends beyond the RSA.</td><td colspan="2">Individual/ household: effect is limited to individuals, families and/or households.
Community: effect extends to the community level.
Regional/Aboriginal peoples: effect extends across the broader regional community/economy, or across one or more First Nations group(s) territories.
Beyond regional: effect extends beyond the regional scale, and may extend across or beyond the province.</td></tr>
<tr><td>Duration</td><td>The length of time the residual effect persists (which may be longer than the duration of the physical work or activity that gave rise to the residual effect).</td><td></td><td>Short term: effect lasts less than 2 years and is restricted to a single Project Phase (e.g., during the Construction Phase of the Project).
Medium term: effect lasts from 2 to 30 years (e.g., encompassing the entire Operations phase).
Long term: effect lasts from 30 to 37 years (e.g., effects last into the Closure phase).
Far future: effect lasts more than 37 years (e.g., effects persist into the Post-Closure Phase).</td><td colspan="2">Short term: effect lasts less than 5 years (e.g., during the construction phase).
Medium term: effect lasts from 6 to 18 years (i.e., encompassing operations and closure phases).
Long term: effect lasts from 19 to 40 years (i.e., effects last into the closure and post-closure phases).
Far future: effect lasts more than 40 years (i.e., effects last into the post-closure phase and beyond).
Permanent: effect is permanent.</td></tr>
</table>

Characterization	General Description			Effects Considered		
		GHG	Surface Water Quality	- Groundwater - Fish and Aquatic Habitat - Wildlife - Terrestrial Environment CEAA 2012: 5(1)(c)	Effects from Accidents and Malfunctions	Economic Effects
Frequency	How often the residual effect occurs and is usually closely related to the frequency of the physical work or activity causing the residual effect.	One time: effect is confined to one discrete event. Sporadic: effect occurs rarely and at sporadic intervals. Regular: effect occurs on a regular basis. Continuous: effect occurs constantly.				
Reversibility	Whether or not the residual effect on the VC can be reversed once the physical work or the activity causing the disturbance ceases.	Reversible: effect can be reversed. Partially reversible: effect can be partially reversed. Irreversible: effect cannot be reversed, is of permanent duration.				