Memo

Date: 12 December 2016

To: KGHM Ajax Mining Inc.

From: Amec Foster Wheeler Environment & Infrastructure

Ref: KGHM Ajax Project
Environmental Assessment Application/Environmental Impact Statement

Re: Round 2 Federal Information Requests – Response to CEAA-046.1

1.0 INTRODUCTION

The KGHM Ajax Project Environmental Assessment Application/Environmental Impact Statement (Application/EIS) for a Comprehensive Study was formally submitted for review to the British Columbia (BC) Environmental Assessment Office and the Canadian Environmental Assessment Agency (CEAA) on January 18, 2016. CEAA provided KGHM Ajax Mining Inc. (KAM) with Information Request (IRs). Amec Foster Wheeler Environment & Infrastructure has prepared this memorandum in response to IR number CEAA-046.1.

2.0 INFORMATION REQUEST

There are two IRs submitted by CEAA on the topic of collection of baseline information for existing fisheries at Jacko Lake, Jacko Creek and Peterson Creek; assessment of effects of the Project on the trout fishery taking into consideration alternative site for fishing; and effectiveness of measures proposed to mitigate effects on the trout fishery.

CEAA-046

"Sections 8.5.2.3 and 13.6.1.2 of the EIS note that Jacko Lake, Jacko Creek and Peterson Creek are valued trout fishery areas for the SSN; however, no information on fishing methods, timing, or fish take are provided in the EIS. Section 13.6.4.1 of the EIS states that no effects on the Aboriginal trout fishery in Jacko Lake are anticipated.

Further, the EIS states that "it is unlikely that SSN obtain a substantial portion of their fish intake from Jacko Lake or Peterson Creek." (Section 13.6.4.1, page 13-59). This statement is based on the presence of an SSN fishwheel in the Thompson River used to catch coho, The proponent uses this as evidence that the SSN are likely to obtain only 10% of their total fish intake from Jacko Lake. Conclusions about SSN Fishing opportunities are based on limited information (e.g. record

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from an NEB Enbridge hearing) and have not been verified by the SSN in the context of this project or through baseline data collection (Section 8.5.2.3, Current Use, page 8.5-25).

Under the former Act a follow-up program is used to verify the accuracy of the environmental assessment (in this case, the statement in Section 13.6.4.1 that no effects on the Aboriginal trout fishery are anticipated), and determine the effectiveness of any measures taken to mitigate the adverse environmental effects of the project.

IR: Describe the efforts that were taken to collect baseline information on the frequency, timing and duration of fishing activity at Jacko Lake, Jacko Creek, and Peterson Creek, including but not limited to specific requests to Fisheries and Oceans Canada and SSN that are known to fish in these areas.

Provide updated baseline data that includes a quantification (e.g, the species caught, the numbers caught and timing of catch) of the existing trout fisheries that are carried out for traditional purposes, in Jacko Lake, Jacko Creek and Peterson Creek. Or, provide a defensible rationale supporting the current approach taken in the EIS.

Describe the alternative opportunities available to the SSN for fishing, including a comparison of the type of fish species available, the catch obtained, the time of use, and any cultural values associated with the alternative locations.

Identify mitigation measures that reduce the environmental effects to the trout fishery (i.e., identify what offset measures proposed to address fish habitat impacts also allow for the continued opportunity to fish trout within the traditional territory of the SSN), taking into account the availability of the resource, the quality of resources, and the quality of the experience, and access. Describe the effectiveness of the mitigation measures in reducing the adverse environmental effects.

Provide the results of an updated assessment of the effects of the project on existing trout fisheries that takes into account the updated baseline data, the opportunity to fish trout elsewhere, and the proposed mitigation measures and their effectiveness. Or, provide a defensible rationale for the current conclusions reached in the EIS that the SSN are likely to pursue trout fishing opportunities elsewhere.

Describe a follow-up program, should one be required, to address uncertainties associated with the ability of the mitigation measures to address effects to Aboriginal Fisheries and describe how the SSN will be consulted in the development and conduct of the follow-up program."

The supplementary memo 0712_KAM_Response to CEAA IR 046 was submitted in response to IR CEAA 046.

CEAA-046.1

"In addition to the low/moderate/high ranking for the effectiveness of mitigation measures, provide a description and where possible quantification of the effectiveness for each mitigation measure on reducing impacts to activities associated with CULRTP rather than a discussion of the effectiveness of the overall Environmental Management Plan.

Confirm that mitigation measures are based on the current design and layout of the Project.

Provide an assessment of the effects of the Project on existing trout fisheries that takes into account updated baseline data in relation to the fisheries and the opportunity to fish trout elsewhere. For changes to effects identified in the response based on the new offsetting plan, provide the specific effects used in the comparison rather than identifying that an effect has decreased. For the effects to the trout fisheries, provide an assessment of significance of the effect.

Describe how SSN will be consulted in relation to the development and conduct of the follow-up program. The response does not clarify whether mitigation measures apply to the Aboriginal fishery or the recreational fishery. Specify which mitigation measures would apply to the Aboriginal fishery."

3.0 RESPONSE

The following information has been prepared to IR CEAA-046.1, presented above.

3.1 Description and Quantification of the Effectiveness of Mitigation Measures on Reducing Impacts to Activities Associated with Current Use of Lands and Resources for Traditional Purposes: Trout Fishery

Summaries of measures proposed to mitigate Project effects on the trout fishery are listed in **Table 1**. The mitigation measures and effectiveness ratings apply to all Aboriginal Groups. In cases where the mitigation measure listed is an Environmental Plan, details have been provided expanding on how the scope and mitigations included in the Plan address mitigation for Current Use of Lands and Resources for Traditional Purposes. In addition to ranking effectiveness of mitigation as high, moderate or low, a description of the effectiveness of mitigation has been added, including quantification of the effectiveness when possible. It is important to note, however, that effectiveness of a mitigation depends on conditions such as proper execution and site conditions. In many cases, quantification of effectiveness of mitigation will be done through monitoring; therefore, monitoring parameters and target criteria have been included. The explanation of high, moderate or low effectiveness ranking criteria is listed in **Table 2**.

It is important to note that all the mitigation measures included in **Table 1** are part of the current Project design.

Table 1: Biophysical Mitigation Measures, Effectiveness of Mitigation Rating and Description

Factor	Mitigation Measure	Rationale for Inclusion	Effectiveness of Mitigation
Fishing Opportunities and Practices			
Change in the availability of fish species harvested	Mitigation and Best Management Practices:		
	Meet the recommended flow threshold for BC streams and, as needed, work with the provincial government to manage releases from the Peterson Creek Downstream Pond to meet instream flow needs. Recycle water to the greatest extent possible.	Maintaining flow thresholds will reduce sub-lethal effects to fish populations and, therefore, maintain the availability of fish species for harvesting.	Moderate The Peterson Creek Diversion System will be designed to preserve flows to existing fish habitat and Aboriginal fishing area downstream of Jacko Lake Dam (JLD1) for a minimum of 100 metres (m) in Peterson Creek. The design further aims to maintain current (pre-mining) flow conditions and allow fish passage as much as practicable. The system will be designed with a low level decant pipe discharge system with a flow capacity in the range of 38 – 71 l/s, as required by the water bailiff according to the requirements for downstream water users (BGC Engineering Inc., 2015). The low-level decant is required during dry periods resulting in lake levels below the spillway/outlet crest elevation. There will be no release from Jacko Lake when the water level falls below the inlet of the decant pipe. Additional hydraulic data and habitat modelling analyses are being undertaken to assess potential impact to fish habitat during October to March (Norwest Corporation, 2016). A memorandum outlining potential mitigation strategies to minimize predicted reduction in streamflows on Lower Peterson Creek was also provided in response to information requests from the BC Ministry of Forests, Lands and Natural Resource Operations and Fisheries and Oceans Canada (DFO). This memo is intended to provide a framework for discussion with regulators and stakeholders. Further, the development of a streamflow mitigation plan that is acceptable to regulators and stakeholders is expected to be an iterative process (BGC Engineering Inc., 2016).
	The potential effects of increased fishing pressure associated with the introduction of workers (who may fish in Jacko Lake) will be mitigated through no-fishing policies for workers and contractors at site during their shifts.	A no-fishing policy for workers and contractors will reduce the potential for increased fishing pressure and maintaining availability of fish populations for harvesting.	High No-fishing policies are an effective measure to limit fishing pressure caused by workers and contractors. The policies will be enforced and those who do not comply will be removed from the Project. This measure will mitigate the potential increase in fishing pressure from introduction of the workforce, representing potentially 17 anglers during the Construction Phase and 10 anglers during the Operation Phase.
	Fish salvage will be conducted in any work areas that will be dewatered.	Fish salvages will return any fish potentially affected by dewatering to their original habitat, keeping them available for harvest.	High Fish salvaging is an effective method to keep fish available by relocating fish from a location that will be disturbed. A significant proportion of fish can be salvaged and survival during the salvage can be as high as 95–100% (Ackerman, 2005).
	Project components that will be constructed within the wetted areas of creeks or lakes (e.g., the northeast dyke, Peterson Creek Bridge and Kamloops Lake Water Intake) will be conducted in the dry, either by scheduling the work for low-flow periods or by isolating (e.g., using cofferdams) and dewatering the work area.	This measure maintains the population of fish in potentially affected waterbodies or schedules construction activities in least-risk windows to minimize effects to the fish populations, ensuring their availability for harvest.	High Conducting construction in the dry is an effective measure to prevent direct fish mortality or injury due to equipment crushing or burying fish and limit indirect impacts to fish caused by changes in water quality due to sediment inputs or leaks of fuel, oil or grease.
	Blast Design (Section 6.7 of the Application/EIS). Description: Blast designs include measures to protect fish and fish habitat, including minimizing the amount of explosives detonated simultaneously, using delays between detonations, and reducing of blast-hole diameters. No blasts will be detonated at the streambed/water interface. Noise and vibration will be monitored to ensure thresholds for the protection of fish are not exceeded.	A review of literature on fish mortality was carried out and it was determined that the measures proposed would not result in residual effects to the fish populations in Jacko Lake; the populations would therefore still be available for harvest.	High Blasts will be designed to limit direct mortality of fish, sub-lethal effects or changes in behaviour due to noise and vibration. The blast design will follow guidelines for the protection of fish (DFO, 2013) and Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky 1998) which are: • Ground vibration level of 13 mm/s PPV • Air blast overpressure level of 194 dBL
	No equipment refuelling or servicing will be undertaken within 30 m of any watercourse or surface water drainage.	This measure will reduce the risk of fuel spills to riparian habitats and into fish-bearing water bodies, maintaining healthy	High A distance of 30 m is considered sufficient to prevent any potential spill of oil, grease or fuel from reaching the watercourse during equipment servicing.

Factor	Mitigation Measure	Rationale for Inclusion	Effectiveness of Mitigation
		habitats and populations for the fish populations available for harvest.	
	All hydraulic machinery entering a stream or waterbody will use hydraulic fluids that are non-toxic to aquatic life and that are readily or inherently biodegradable.	Use of biodegradable hydraulic fluids will reduce mortality to fish populations exposed to this machinery and ensure their availability for harvest.	High This measure is effective at limiting mortality of fish caused by direct toxicity or long-term contamination of water by machinery entering a stream.
	Surface Water Quality Management and Monitoring Plan (SWQMMP) (Section 11.23) Description: The focus of the SWQMMP is on minimizing Project effects on surface water quality, regulatory compliance, monitoring the effectiveness of mitigation measures, and verifying the predictions completed as part of the effects assessment of the Project. The primary source of mitigation measures for surface water quality is the Water Management and Hydrometric Monitoring Plan (Section 11.7). The SWQMMP is designed to limit generation of contact water (i.e., water that comes into contact with and may pick up a geochemical load from a Project facility) and to prevent sediment laden runoff from leaving the site.	Implementation of Best Achievable Control Technology or management practices will maintain surface water quality and resources available for harvest.	Moderate By implementing a combination of measures, effects on surface water quality will be mitigated. To ensure effectiveness of the mitigation measures, the SWQMMP details procedures for monitoring surface water quality and ensure, among others, that parameters listed in the *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (CCME, 1999) are met. This guideline presents thresholds values for water parameters such temperature, dissolved oxygen, turbidity, pH, nutrients, metals and organics within a range suitable for maintaining healthy populations of fish and other aquatic organisms. Monitoring will be implemented with a focus on assessing for changes in surface water quality compared to baseline and predicted concentrations, water quality guidelines and site-specific water-quality benchmarks.
	Groundwater Quality Management and Monitoring Plan (GWQMMP) (Section 11.24) Description: The focus of the GWQMMP is on regulatory compliance, monitoring the effectiveness of mitigation measures, and verifying the predictions completed as part of the effects assessment of the Project. The primary source of mitigation measures for groundwater quality is the Water Management and Hydrometric Monitoring Plan (Section 11.7). The GWQMMP is designed to protect groundwater quality from seepage and runoff down-gradient of Project facilities in the Peterson Creek watershed.	Implementation of Best Achievable Control Technology or management practices will maintain groundwater quality and resources available for harvest.	High By implementing a combination of measures, effects on groundwater quality will be mitigated, contributing to maintaining fish availability. To ensure effectiveness of the mitigation measures, the Groundwater Flow Model incorporated sensitivity analyses that help to evaluate their effectiveness, as well as other sources of uncertainty in the models. For example, the groundwater flow scenarios show that the majority of seepage pathways from the Tailings Storage Facility (TSF) and Mine Rock Storage Facilities (MRSFs) are to the Open Pit; however, all scenarios have some seepage pathways that eventually reach the receiving environment in Peterson Creek (ERM, 2016a). The GWQMMP relies on monitoring to verify the mitigation and management measures are adequate, perform as predicted in the effects assessment, and provide information for adaptive management if unanticipated effects on groundwater are discovered. Groundwater quality results will be compared against baseline ranges for each monitoring well, as well as generic water quality guidelines. For most parameters, action triggers will be developed for monitoring results that exceed generic water quality guidelines specific to the downstream users.
	Erosion and Sediment Control Plan (ESCP) (Section 11.2) Description: The ESCP has been established to manage mitigation approaches designed to prevent or minimize erosion and contain sediment within the mine site. The environmental protection measures associated with mitigation of erosion and sedimentation focus on: • Incorporation of erosion and sedimentation control into design and planning (e.g. minimize disturbance, progressive reclamation); • Application of erosion control Best Management Practices (BMPs) (e.g., re-contouring stockpiles of soil and overburden to a 2H:1V slope and seeding for erosion control); • Application of sediment and runoff control BMPs (e.g., minimizing the area of exposed soils, timely seeding and planting, and the use of erosion control measures appropriate to the soil erodibility potential in the TSF); and • Monitoring and maintenance (e.g., sediment control and runoff management structure functionality will be maintained by removing sediment captured in traps before it exceeds 15% loss of trap capacity).	Implementation of Best Achievable Control Technology or management practices will maintain surface water quality and resources available for harvest.	High By implementing a combination of measures, such as erosion control, effects on water quality will be mitigated, contributing to maintaining fish availability. To ensure effectiveness of the mitigation measures, the ESCP relies on continuous monitoring to verify that the management practices are adapted to local conditions, are properly executed, and, if needed, more detailed site-specific prescriptions are completed. For example, areas affected by erosion will be mapped and information—including erosion type, intensity, the extent of the affected area, site UTM coordinates, and existing control measures and an assessment of their performance—will be documented. Affected sites will be regularly checked for evidence of erosion, particularly after rainfall events, until erosion is not a concern. Monitoring results will be used to trigger an appropriate adaptive management response. The effectiveness of the ESCP will be assessed regularly (at least annually). The reviews will reflect changes in environmental requirements, technology and operational procedures.

Factor	Mitigation Measure	Rationale for Inclusion	Effectiveness of Mitigation
	Metal Leaching and Acid Rock Drainage (ML/ARD) Management and Monitoring Plan (Section 11.5) Description: The purpose of the ML/ARD Management and Monitoring Plan is to formulate a series of operational procedures and closure activities that will avoid the development of acidic drainage from the Project Mine Rock Storage Facilities (MRSFs), TSF and ore stockpiles and minimize the impact of neutral metal leaching to the receiving environment from these facilities. Management strategies specific to the Project include the following: • Locate mine rock storage facilities to areas east and south of the Open Pit to increase distance from the City of Kamloops and facilitate collection of seepage; • Segregate high-risk versus low-risk rock types in the pit; • Blend potentially acid generating (PAG) and non-potentially acid generating (NPAG) materials in proportions appropriate to prevent ARD onset; • Construct a NPAG base for the blended MRSFs; • Limit infiltration by the implementation of a cover; • Minimize east MRSF size and construct only of NPAG material to limit seepage over the Peterson Creek Aquifer; • Peterson Creek Diversion constructed to limit the quantity of contact water discharging to Peterson Creek; • In-pit backfill contains seepage and prevents discharge to receiving water streams; and • Use liner systems in the TSF where tailings are in contact with embankments to limit infiltration of tailings pore water.	Implementation of Best Achievable Control Technology or management practices will maintain surface water quality and resources available for harvest.	High By implementing a combination of measures to prevent development of acidic drainage, negative effects on water quality (e.g., changes in pH and concentration of metals), and therefore on fish can be mitigated. Effective mitigation is achieved by addressing geochemical, hydrological and geotechnical factors of risks (BC MEM, 1998) through a diversity of measures. For example, blending PAG and NPAG mine rock might be an effective measure to prevent generation of acid drainage when comprehensive material characterization, waste design and construction plans are supported by detailed prediction information (BC MEM, 1998). Similarly, the use of a cover on waste rock piles is an effective measure to reduce water infiltration. The MRSF closure cover reduces infiltration through the mine rock and into the groundwater system. As outlined in Appendix A of Appendix 6.4-C of the Application/EIS, a cover design that incorporates a 0.6 m till layer (0.3 m of which is compacted) between the mine rock and the topsoil is anticipated to reduce annual infiltration from 44 millimetres (mm) to 8 mm. To ensure effectiveness of the mitigations, monitoring will include: in-pit monitoring and sampling (e.g., ore identification and management, segregation of PAG and NPAG mine rock), seepage and tailings slurry water quality monitoring, and commissioned of on-site laboratory.
	Air Quality Monitoring and Dust Control Plan (Section 11.6) Description: This Plan includes measures to reduce emissions and dust that could deposit on water surfaces. A supplemental submission was developed that provides more detail related to how dust mitigation measures will be implemented. This is documented in *Memorandum: Management of Fugitive Dust* (KAM, 2016a). As outlined in this Plan, both preventative procedures and reactive control measures will be implemented in order to minimize dust emissions from the Project. Some key examples include: • Daily visual inspections of the TSF and active haul roads; • Application of water to the tailings beach and haul roads; • Application of dust suppressants on the TSF tailings beach and haul roads; • Application of surfactants to the haul roads; • Rotation of tailing spigot points; and • Use of polymers in the tailings thickening process and direct application to the tailings beach, when required.	Implementation of Best Achievable Control Technology or management practices for dust management will minimize dust deposition onto Jacko Lake and maintain surface water quality and resources available for harvest.	High By implementing a combination of measures, including dust control, effects on water quality will be mitigated, contributing to maintaining fish availability. To ensure effectiveness of the mitigation measures, the Air Quality Monitoring and Dust Control Plan relies on continuous monitoring. It can be expected to regularly and consistently achieve 90% effectiveness on dust control. Scenarios of lower effectiveness (e.g., 70% or 80%) would be infrequent and short-duration episodes, especially when tracked through an effective monitoring and adaptive management system. Monitoring will identify changes in air quality in relation to guidelines and standards established by Canadian and BC applicable regulatory criteria.
	Water Management and Hydrometric Monitoring Plan (Section 11.7) Description: The water quality model of the Project was updated during the first round of IRs. The site water quality predictions in the TSF and water management ponds changed as a result of modifications to the water balance model, baseline inputs and geochemistry source terms for the mine source materials. The updated results of the assessment and	Contact vs non-contact water management is an intrinsic part of Project design. Water management practices will maintain surface water quality and resources available for harvest.	High By implementing a combination of measures, effects on water flow will be mitigated, contributing to maintaining fish availability. To ensure effectiveness of the mitigation measures for water flow, site monitoring and a follow-up program will be implemented to evaluate and document if the Water Management and Hydrometric Monitoring Plan is successfully avoiding and minimizing potential adverse effects to the environment.

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	water quality mitigation measures are detailed in the document *KGHM Ajax Mining Inc. Ajax Project: Water Quality Prediction Updates and Information Request Responses* (Knight Piésold Consulting Ltd., 2016a). Some key examples of mitigation measures in the mine site Water Management and Hydrometric Monitoring Plan include: • South Mine Rock Storage Facility (SMRSF) Pond: manage seepage and runoff from the southern extent of the SMRSF; • Reclamation of SMRSF in Decommissioning and Closure with a low permeability till layer overlain with topsoil to reduce infiltration and maximize evapotranspiration and runoff; • Dry cover on TSF to reduce infiltration into the underlying tailings solids and increase non-contact runoff; • Peterson Creek Downstream Pond: interception of seepage from the SMRSF and West MRSF with associated water management ponds, reclaimed to mill for Operation Phase water demand. • Mitigation measures for flow reductions in Peterson Creek will be implemented to ensure that existing water license requirements are met. Eight potential mitigation options were identified and outlined in *Memorandum: Peterson Creek – Potential Streamflow Mitigation Strategies* (BGC Engineering Inc., 2016). Individually, or in combination, these options could be implemented to minimize or completely offset Project-related effects, and could also potentially benefit fish habitat in Lower Peterson Creek.		Specifically, monitoring will be used, in part, to verify the accuracy of flow predictions of the Environmental Assessment and determine the effectiveness of mitigation measures designed to reduce environmental effects, thus informing management if prescribed actions are meeting objectives. If adverse findings are evident from the monitoring of a particular area or process, adaptive management policies will be implemented. All monitoring components will be evaluated regularly to assess if changes to the schedule, frequency or component continue to be required or adaptively changed.
	Explosives Management Plan (Section 11.11) Description: This Plan includes measures to minimize effects on water and aquatic life related to transportation, on-site manufacturing, storage and use of explosives. For example, one measure is to limit the potential for the introduction of nitrogenous nutrients from explosives to water. In relation to the location of the explosive facilities, *Memorandum: Location of the explosives facility* (KAM, 2016b) states that the alternate location for the explosives manufacturing and storage as presented in the Application/EIS would now be the confirmed location for this facility. The selected location is situated 4.5 kilometres (km) northwest of the pit.	Explosives handling practices will minimize potential for interactions with surface water quality and maintain habitats and resources available for harvest.	<u>High</u> The Explosives Management Plan will include detailed plans of the explosives facility, specifications for the maintenance of an inventory system, etc., to ensure proper management of explosives. To verify effectiveness of measures included in the Plan, monitoring includes regular inspections of storage facilities for leaks or non-compliance with policies and procedures.
	Soil Salvage and Handling Plan (Section 11.3) This Plan includes measures and procedures for adequate soil handling as well as erosion control on stockpiles, limiting transport of soil to the aquatic environment. The Soil Salvage and Handling Plan provides the procedures for soil stripping and quality control of soil salvaging.	Soil handling practices, in combination with Erosion and Sediment Control, will minimize potential for interactions with surface water quality and resources available for harvest.	<u>High</u> By implementing best managements practices while salvaging soil (e.g., avoiding soil salvaging during adverse weather, protecting soil stockpiles against erosion), the potential for erosion and transport of soil to the aquatic environment can be effectively mitigated thus indirectly protecting fish habitat and availability of fish. To achieve effective mitigation, soil stripping management and erosion will be monitored, as will soil contamination (e.g., potential contaminant accumulation and metal deposition / mobility patterns). Soil quality should be maintained within Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (CCME, 2013) and Soil Criteria for Toxicity to Soil Invertebrates and Plants listed in the *Contaminated Sites Regulation*, included in BC's *Environmental Management Act*.
	Dark Sky Management and Monitoring Plan (Section 11.19) This Plan included measures to eliminate spill light and glare and limit sky glow, which can affect behaviour of wildlife, including fish surrounding the Project. Protection measures will include illumination management (e.g., setting timers, placing motion sensors), shielding and direct lighting (e.g., directing light and/or shielding light to target	Implementation of Best Achievable Control Technology or management practices will maintain habitats and resources available for harvest.	<u>High</u> The Dark Sky Management and Monitoring Plan includes measures for spectral control that are effective for limiting the effect of spill light, which may have an effect on fish. Native flora and fauna are often sensitive and responsive to light in the short wavelength range (less than 500 nm), where ultraviolet light plays an important role for navigation, foraging and mate selection (Bruce-White & Shardlow, 2011). The use of 500 nm filtered LED

Factor	Mitigation Measure	Rationale for Inclusion	Effectiveness of Mitigation
	areas), and spectral control (e.g., use of 500 nanometre [nm] filtered LED fixtures).		fixtures will make it possible to control the colour of the light and limit the effect of spill light at the local scale and the effect of sky glow at the regional scale. Sky darkness will be monitored at least twice a year and compared to baseline conditions to determine changes resulting from Project illumination. If changes in sky darkness are observed, then adaptive management lighting options will be assessed based on magnitude and duration of the activities as well as in response to concerns raised by local residents.
	Noise and Vibration Management Plan (Section 11.22) This Plan includes measures to achieve vibration objectives and limit blast-related vibration effects for the Jacko Lake fish habitat area.	Implementation of Best Achievable Control Technology or management practices will maintain habitats and resources available for harvest.	<u>High</u> To ensure effectiveness of mitigation measures, the Plan includes monitoring of vibration limits according to various guidelines. In particular for the protection of fish in the Jacko Lake area, the Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters will be followed (Wright & Hopky, 1998). This guideline specifies that no explosive is to be detonated in or near fish habitat that produces, or is likely to produce, an instantaneous pressure change (i.e., overpressure) greater than 100 kPa (14.5 psi) to prevent the overpressure from damaging fish swimbladder, kidney, liver, spleen, fish eggs and larvae.
	Fisheries and Aquatic Life Monitoring Plan (Section 11.25) The Fisheries and Aquatic Life Monitoring Plan focuses on ensuring regulatory compliance, implementation of mitigation measures, monitoring the effectiveness of mitigation measures, and verifying the predictions completed as part of the assessment of potential effects, including: • Loss of habitat in Peterson Creek related to the Open Pit and the MRSFs; • Loss of habitat and altered fish distribution and abundance in Peterson Creek downstream of the Project resulting from reduced flow; • Impact of mining dust and vibrations on fish in Jacko Lake; and • Loss of habitat in northeastern arm of Jacko Lake related to Open Pit development; etc.	Implementation of Best Achievable Control Technology or management practices to maintain surface water quality and maintain habitats to ensure resources are available for harvest.	<u>Moderate</u> To ensure effectiveness of mitigation measures to protect fish and fish habitat, the Fisheries and Aquatic Life Monitoring Plan includes monitoring procedures. For example, under the *Fisheries Act* Authorization, it is required to monitor that environmental protection measures are in place and in working order, measure the affected habitat area, monitor water quality, make visual observations regarding fish and fish habitat and evaluate the post-construction effectiveness of the habitat offsetting works (on vegetation, hydrological conditions, and fish and fish habitat).
	<u>Compensation:</u>		
	Fish Habitat Offsetting Measures (Knight Piésold Consulting Ltd., 2016b) The updated Fish Habitat and Fishery Offsetting Plan includes components to support revitalization and continuation of the asserted SSN spring fishery at both the inlet and outlet of Jacko Lake. The measures proposed to enhance salmon habitat in Lower Peterson Creek also recognize broader stewardship interests of the SSN and other Aboriginal Groups regionally (ERM, 2016b).	Development of the Project would result in the permanent loss of fish habitat and associated productive capacity; therefore, offsetting options are required. Offsetting is required when residual, serious harm to fish remains after avoidance and implementation of mitigation measures.	<u>High</u> Based on the updated Fish Habitat and Fishery Offsetting Plan, net losses due to the Project are calculated to be 51,051 habitat units in total, which are proposed to be offset by 67,151 habitat units. The net increase in surface area and storage volume in Jacko Lake, combined with proposed enhancements to Upper Peterson Creek, will at minimum maintain and potentially increase productive capacity and rearing habitat for rainbow trout in Jacko Lake.
Change in access to, ability to access, or use of fishing areas	Install appropriate signage indicating blasting times.	Signage will inform fishers at Jacko Lake about appropriate times to access the area for fishing.	<u>High</u> Informing about blasting times will facilitate fishers' planning their access to the area at the most appropriate times to avoid blasting disturbances.
	Transportation Management Plan (Section 11.20) The following measures to manage traffic and minimize environmental impact are included in this Plan: industry-recognized design criteria and construction management practices for access improvement works; commuting trip demand reduction through car or vanpooling, bus staging, and staggering of shifts; heavy vehicle routing, including implementation of two-way radio communication and control processes to manage traffic movement as required; on- and off-site parking management for commuting staff; and spill containment and sediment control practices.	Access to fishing can be changed by increased mine-associated traffic; therefore, this mitigation measure was included.	<u>High</u> The access to the area for fishing will be less affected if traffic caused by the Project is reduced, which will result in increased road safety and decreased disruptions and delays compared to conditions if traffic is not controlled.

Factor	Mitigation Measure	Rationale for Inclusion	Effectiveness of Mitigation
	Supporting actions include: employment contract incentives for participation in initiatives to reduce travel demand; workplace travel planning; and community information, reporting, and feedback programs.		
	Compensation:		
	Ajax Mining Inc. Ajax Project: Conceptual Fish Habitat and Fishery Offsetting Plan This Plan includes improved access to Jacko Lake via a new road, boat launch, day-use area and shoreline trails for fishers. Access to the outlet of Jacko Lake at Peterson Creek will be retained throughout mine construction, operation and post-closure.	Access to fishing can be changed by increased mine-associated construction activities; therefore, these measures were added to the revised fisheries offsetting plan.	High By developing a new access road, boat launch and shoreline trails, the access to Jacko Lake for fishing will be maintained.
Change in the experience of using land and resources (sensory disturbances)	Noise mitigation through Project design includes the following measures: conveyor from crusher to plant will be covered to reduce noise emission; enclosed heavy equipment such as mills, secondary crusher, compressors, pumps, and motors will be located inside buildings; roads will be designed to minimize haul distances; large trucks will be used for ore and waste transport to minimize the number of trips required between the source and destination; and mobile equipment will be equipped with the manufacturer-recommended exhaust mufflers (Section 10.5).	Implementation of Best Achievable Control Technology or management practices will decrease the effects of noise and vibration on those practicing traditional uses of the lands.	High By implementing a combination of measures to reduce noise generated by the Project, noise levels will be maintained within target thresholds and will not prevent users of the area to undertake traditional activities. Noise and vibration will be monitored to ensure performance objectives are achieved and thresholds for the protection of fish and human health are not exceeded.
	Blast Design (Section 10.5) Blast design minimizes disturbances to Jacko Lake and its users through measures including minimizing the amount of explosives detonated simultaneously, use of delays between detonations and reduction of blast-hole diameters. No blasts will be detonated at the streambed/water interface. Blasting will not occur during the seasonal spring trout fishery from sunrise to 10:00 AM if Aboriginal fishers are present.	Implementation of Best Achievable Control Technology or management practices will decrease the effects of noise and vibration on those practicing traditional uses of the lands.	High Implementation of a blast design that considers avoiding blasting during seasonal spring trout fishery is an effective measure to mitigate blasting disturbance to fishers. Noise and vibration will be monitored to ensure performance objectives are achieved and thresholds for the protection of fish and human health are not exceeded.
	Limit the use of vehicle horns during each shovel and haul truck loading cycle (Section 10.5).	Implementation of Best Achievable Control Technology or management practices will decrease the effects of noise on those practicing traditional uses of the lands.	Moderate Reducing to a minimum the frequency of vehicles horns emitted during daily hauling operations will contribute to maintaining the noise levels in the area to a level that will not prevent traditional activities from being undertaken. Noise levels will be maintained within guidelines for human health.
	Use multi-passenger vehicles to transport crews to and from job sites to reduce overall traffic noise emission (Section 10.5).	This will reduce the number of vehicles on the roads, reducing traffic noise and emissions.	High Reducing traffic noise will contribute to maintaining the noise levels in the area to a level that will not prevent traditional activities from being undertaken. Noise levels will be maintained within guidelines for human health.
	Conduct piling activities only during the daytime period (Section 10.5).	Implementation of Best Achievable Control Technology or management practices will decrease the effects of noise on those practicing traditional uses of the lands.	High Limiting noise from piling activities will contribute to maintaining the noise levels in the area to a level that will not prevent traditional activities from being undertaken. Noise levels will be maintained within guidelines for human health.
	Noise mitigation and noise management plan (Section 10.5) This Plan includes measures to mitigate noise during each phase of the Project. General measures include the following: limit the use of vehicle	Implementation of Best Achievable Control Technology or management practices will	High By implementing a combination of measures to reduce noise generated by the Project, noise levels will be maintained to a level that will not prevent traditional activities from

Factor	Mitigation Measure	Rationale for Inclusion	Effectiveness of Mitigation
	horn during each shovel and haul truck loading cycle to the extent allowed by safety regulations; operate vehicles within the posted maximum speed limits to reduce noise emission; use multi-passenger vehicles to transport crews to and from job sites to reduce overall traffic noise emission; conduct piling activities only during the daytime period; select best achievable technology (technology that can achieve lower noise emissions and that has been shown to be economically feasible through commercial application) for mine fleet equipment; maintain vehicles in good operating condition to meet emission standards (especially with exhaust silencers/mufflers); etc.	decrease the effects of noise on those practicing traditional uses of the lands.	being undertaken. Noise and vibration will be monitored to ensure performance objectives are achieved and thresholds for the protection of human health are not exceeded.
	Vibration management plan for blasting activities (Section 10.5) This Plan includes measures to mitigate vibration during each phase of the Project. Measures applicable to all phases include the following: manage and revise the controllable blast design parameters (i.e., confinement, charge length and diameter, charge decoupling, direction of initiation, and total shot duration) on an ongoing basis as needed during the Operation Phase; monitor ground vibrations and correlate with blast design predictions to determine if changes to blast design or procedures are necessary to reduce vibration; etc.	Implementation of Best Achievable Control Technology or management practices will decrease the effects of noise on those practicing traditional uses of the lands.	High Implementation of a blast design that considers not blasting at preferred fishing times, particularly during seasonal spring trout fishery, is an effective measure to mitigate blasting disturbance to fishers. Noise and vibration will be monitored to ensure performance objectives are achieved and thresholds for the protection of human health are not exceeded.
	Progressive re-vegetation of Project components and other disturbed areas will be completed on an ongoing basis during the Construction and Operation phases, with larger Project components further re-vegetated at Decommissioning and Closure (Section 8.3). Successful vegetation establishment will enhance the aesthetics of the area.	This measure will provide for the rapid re-vegetation of all temporarily disturbed areas and will minimize visual effects for Project components that may be visible to those practicing traditional uses of the lands.	Moderate Revegetation of disturbed areas in an effective way to enhance the aesthetics and natural aspect of the area although it requires time. The effectiveness of this measure increases as vegetation establishes in more areas overtime, through progressive revegetation. Revegetation has been successfully applied in numerous mine sites in Canada and around the world. When proper planning and testing is conducted and post-closure care and maintenance is applied, habitats develop to meet specified targets. The criteria to determine revegetation effectiveness will be strongly dependent on the agreed revegetation goal. Often, the goal is a diverse plant community of native species including grasses, forbs, shrubs and trees. For example, for woody species (trees and shrubs), a survival rate of at least 80% a year after planting is considered good short-term success. After 5 years, a 75% survival is considered good.
	Employ good visual design principles (Section 8.3) The visual design of the Project will consider local and regional landscape patterns and geometry (e.g., slope) in order to meet the needs of the resource values of the surrounding area, including economic, recreational and social values. Opportunities include: selecting plants for revegetation to match surrounding areas; sloping the Project components similarly to surrounding geomorphic characteristics; avoiding straight edges and instead contouring to form “ridges” or “valleys” when possible; among others.	Implementation of Best Achievable Control Technology or management practices will decrease visual effects on those practicing traditional uses of the lands.	High Designing elements of the Project to mimic as much as possible the natural landforms, relief and vegetation of the area is an effective way to reduce the visual contrast caused by Project disturbances in the landscape.
	Infrastructure aesthetics will consider use of non-reflective materials in the construction of buildings and other infrastructure.	Implementation of Best Achievable Control Technology or management practices will decrease visual effects on those practicing traditional uses of the lands.	Low This measure will contribute to reducing the visual contrast of the Project with the surrounding environment.
	Infrastructure will be painted with natural colours that blend into the landscape or will be screened with tall shrubs or trees.	Implementation of Best Achievable Control Technology or management practices will decrease visual effects on those practicing traditional uses of the lands.	Low This measure will contribute to reducing the visual contrast of the Project with the surrounding environment.
	During the Post-Closure Phase, the re-vegetation of the Project components will be monitored to ensure that the vegetation is taking hold and growing in a manner sufficient to mimic the surrounding landscape.	Implementation of Best Achievable Control Technology or management practices will decrease visual effects on those practicing traditional uses of the lands.	Moderate Revegetation of disturbed areas in an effective way to enhance the aesthetics and natural aspect of the area although it requires time. The effectiveness of this measure increases as vegetation establishes in more areas overtime, through progressive revegetation. Revegetation has been successfully applied in numerous mine sites in Canada and around

Factor	Mitigation Measure	Rationale for Inclusion	Effectiveness of Mitigation
			the world. When proper planning and testing is conducted and post-closure care and maintenance is applied, habitats develop to meet specified targets. The criteria to determine revegetation effectiveness will be strongly dependent on the agreed revegetation goal. Often, the goal is a diverse plant community of native species including grasses, forbs, shrubs and trees. For example, for woody species (trees and shrubs), a survival rate of at least 80% a year after planting is considered good short-term success. After 5 years, a 75% survival is considered good.
Changes in the quality of resources	<u>To Mitigate Dust Fall on Water Bodies:</u>		
	Haul-road-associated dust will be mitigated with use of coarse gravel and aggregate material on road beds and by minimizing haul distances.	Implementation of Best Achievable Control Technology or management practices will minimize dust and contaminants entering water bodies and decreasing the quality of fish tissue.	<u>High</u> Implementing dust control measures can be expected to regularly and consistently achieve 90% effectiveness on dust control. Scenarios of lower effectiveness (e.g., 70% or 80%) would be infrequent and short-duration episodes, especially when tracked through an effective monitoring and adaptive management system.
	Other operational mitigation measures include watering haul roads, reducing idling of vehicles and equipment, and maintaining mobile equipment to meet emission standards.	Implementation of Best Achievable Control Technology or management practices will minimize dust and contaminants entering water bodies and decreasing the quality of fish tissue.	
	Design mitigation measures include the installation of covers over coarse and fine ore stockpiles.	Implementation of Best Achievable Control Technology or management practices will minimize dust and contaminants entering water bodies and decreasing the quality of fish tissue.	
	Implement dust collectors and the use of covered concentrate transport trucks.	Implementation of Best Achievable Control Technology or management practices will minimize dust and contaminants entering water bodies and decreasing the quality of fish tissue.	
	<u>To Mitigate Effects on Water Quality:</u>		
	Water Management and Hydrometric Monitoring Plan (Section 11.7) Description: The water quality model of the Project was updated during the first round of IRs. The site water quality predictions in the TSF and water management ponds changed as a result of modifications to the water balance model, baseline inputs and geochemistry source terms for the mine source materials. The updated results of the assessment and water quality mitigation measures are detailed in the document *KGHM Ajax Mining Inc. Ajax Project: Water Quality Prediction Updates and Information Request Responses* (Knight Piésold Consulting Ltd., 2016a). Some key examples of mitigation measures in the mine site Water Management and Hydrometric Monitoring Plan include: • SMRSF Pond: manage seepage and runoff from the southern extent of the SMRSF; • Reclamation of SMRSF in Decommissioning and Closure with a low permeability till layer overlain with topsoil to reduce infiltration and maximize evapotranspiration and runoff; • Dry cover on TSF to reduce infiltration into the underlying tailings solids and increase non-contact runoff; • Peterson Creek Downstream Pond: interception of seepage from the SMRSF and West MRSF with associated water management ponds, reclaimed to mill for Operation Phase water demand.	Contact vs non-contact water management is an intrinsic part of Project design. Water management practices will minimize contaminants entering water bodies and decreasing the quality of fish tissue.	<u>High</u> By implementing a combination of measures, effects on water quality will be mitigated, contributing to maintaining fish quality. To ensure effectiveness of the mitigation measures, site monitoring and follow-up programs will be implemented to evaluate and document if the Water Management and Hydrometric Monitoring Plan is successfully avoiding and minimizing potential adverse effects to the environment. Specifically, monitoring will be used in part to verify the accuracy of flow predictions of the Environmental Assessment and determine the effectiveness of mitigation measures designed to reduce environmental effects, thus informing management if prescribed actions are meeting objectives. If adverse findings are evident from the monitoring of a particular area or process, adaptive management policies will be implemented. All monitoring components will be evaluated regularly to assess if changes to the schedule, frequency or component continue to be required or adaptively changed.

Factor	Mitigation Measure	Rationale for Inclusion	Effectiveness of Mitigation
	• Mitigation measures for flow reductions in Peterson Creek will be implemented to ensure that existing water license requirements are met. Eight potential mitigation options were identified and outlined in *Memorandum: Peterson Creek – Potential Streamflow Mitigation Strategies* (BGC Engineering Inc., 2016). Individually, or in combination, these options could be implemented to minimize or completely offset Project-related effects, and could also potentially benefit fish habitat in Lower Peterson Creek.		
	Construction Waste Management Plan (Section 11.4) This Plan includes measures to handle, storage and dispose of solid waste during construction of the Project.	Siting of waste management facilities and implementation of appropriate waste management practices will minimize contaminants entering water bodies and decreasing the quality of fish tissue.	High Managing solid waste is an indirect measure to protect the quality of resources by preventing non-hazardous waste and putrescible food from reaching the waterbodies and contaminating fish and fish habitat during construction of the Project.
	Solid Waste Management Plan (Section 11.9) This Plan includes measures to handle, storage and dispose of solid waste during operation of the Project.	Siting of waste management facilities and implementation of appropriate waste management practices will minimize contaminants entering water bodies and decreasing the quality of fish tissue.	High Managing solid waste is an indirect measure to protect the quality of resources by preventing non-hazardous waste and putrescible food from reaching the waterbodies and contaminating fish and fish habitat during operation of the Project.
	Soil Salvage and Handling Plan (Section 11.3) This Plan includes measures and procedures for adequate soil handling as well as erosion control on stockpiles, limiting transport of soil to the aquatic environment. The Soil Salvage and Handling Plan provides the procedures for soil stripping and quality control of soil salvaging.	Soil handling practices, in combination with Erosion and Sediment Control, will minimize potential for contaminants entering water bodies and decreasing the quality of fish tissue.	High By implementing best managements practices while salvaging soil (e.g. avoiding soil salvaging during adverse weather, protecting soil stockpiles against erosion), the potential for erosion and transport of soil to the aquatic environment can be effectively mitigated thus indirectly protecting fish habitat and availability of fish. To achieve effective mitigation, soil stripping management and erosion will be monitored, as will soil contamination (e.g., potential contaminant accumulation and metal deposition / mobility patterns). Soil quality should be maintained within Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (CCME, 2013) and Soil Criteria for Toxicity to Soil Invertebrates and Plants listed in the *Contaminated Sites Regulation*, included in BC's *Environmental Management Act*.
	Hazardous Waste Management Plan (HWMP) (Section 11.10) This Plan includes measures for classifying, handling, storing, transporting and disposing of hazardous waste materials that could impact fish habitat during construction, operation and closure.	Siting of waste management facilities and implementation of appropriate waste management practices will minimize contaminants entering water bodies and decreasing the quality of fish tissue.	High By implementing a combination of measures, including hazardous waste management, effects on water quality will be mitigated, contributing to maintaining fish quality. To ensure effectiveness of the mitigation measures, the HWMP relies on monitoring to ensure storage, movements and treatment of hazardous waste meet performance objectives and regulatory guidelines. Monitoring will include documentation of each shipment to ensure traceability; inspections of hazardous waste storage areas, landfarm, and oil water separator; and others.
	Risk Management Plan (RMP) (Accidents and Malfunctions) (Section 11.12) This Plan includes measures for early detection of major risks, risk reduction, loss control and strategies to minimize the effects on the environment, including fish habitat. The risks of major concern that warrant specific environmental protection measures are failure of the pit wall adjacent to Jacko Lake and failure of the TSF through dam break and inundation. The mitigation measures included in the Plan are of proactive/preventative nature and include design measures to prevent pit wall failure and TSF dam breach. For example, the TSF includes several design features that significantly improve embankment stability and protect against downstream slope failures that could lead to a breach. These are a mine rock buttress and/or MRSF included on the downstream side of the northern and eastern embankments to increase the Factor of Safety against a breach several times higher than the minimum design requirement; additional freeboard allowance for	Implementation of risk management practices will minimize potential for contaminants entering water bodies and decreasing the quality of fish tissue.	High To ensure effectiveness of the mitigation measures, the RMP relies on monitoring the risk protection measures incorporated in the engineering design of the Project, fundamentally of the pit wall adjacent to Jacko Lake and of the structural integrity of the TSF. A Quantitative Risk Assessment of dam breach risk is envisaged and additional mitigation measures will be evaluated for inclusion in the next stage of design.

Factor	Mitigation Measure	Rationale for Inclusion	Effectiveness of Mitigation
	Probable Maximum Flood conditions and wave-run up for all stages of dam development; an absence of continuous weak layers that could adversely impact dam foundation stability; and the supernatant pond located several hundred metres from the dam (post start-up).		
	Emergency Response Plan (ERP) (Section 11.14) This Plan includes measures and procedures to address emergencies, that is, situations that immediately threaten the well-being of people and the environment, emphasizing containment, notification and mobilization to deal with the emergency (e.g., wildlife encounters and incursions, seismicity, and water or tailings management failure).	Implementation of emergency response planning will ensure timely incident response and minimize contaminants entering water bodies and decreasing the quality of fish tissue.	High By implementing the measures and procedures outlined in the ERP, it would be possible to quickly address and contain risks associated with specific emergencies, thus limiting negative effects on the environment and protecting the quality of traditional resources harvested (e.g., fish).
	Landscape Design and Restoration Plan (Section 11.26) This Plan includes conceptual strategies to achieve landscape capability and productivity objectives, with the final goal of establishing self-sustaining vegetation communities that will foster the development of functional Post-Closure Phase ecosystem units consistent with the Valued Components (VCs) identified for the Project. The specified end land uses are agriculture, wildlife and recreation. The Plan outlines the goals of constructing geologically stable landforms with low rates of soil erosion, maintaining acceptable water quality standards, mitigating aesthetic and environmental impacts, restoring ecological functions, and meeting end land-use objectives during operation and closure of the Project.	Planning for restoration and closure will minimize potential for contaminants entering water bodies and decreasing the quality of fish tissue.	Moderate Incorporating the end land uses into the Project design is an effective way to direct the implementation of mitigation measures towards achieving the end land uses. For example, stockpiling or relocating salvaged soils to areas that will soon be revegetated, thus reducing the potential for soil erosion; increasing or enhancing fish habitat to maintain traditional fishing practices; selecting and planting species that will enhance wildlife habitat for hunting or for plant gathering around Jacko Lake, etc.
	GWQMMP (Section 11.24) Description: The focus of the GWQMMP is on regulatory compliance, monitoring the effectiveness of mitigation measures and verifying the predictions completed as part of the effects assessment of the Project. The primary source of mitigation measures for groundwater quality is the Water Management and Hydrometric Monitoring Plan (Section 11.7). The GWQMMP is designed to protect groundwater quality from seepage and runoff down-gradient of Project facilities in the Peterson Creek watershed.	Implementation of Best Achievable Control Technology or management practices will minimize contaminants entering water bodies and decreasing the quality of fish tissue.	High By implementing a combination of measures, effects on groundwater quality will be mitigated, contributing to maintaining fish availability. To ensure effectiveness of the mitigation measures, the Groundwater Flow Model incorporated sensitivity analyses that help to evaluate their effectiveness, as well as other sources of uncertainty in the models. For example, the groundwater flow scenarios show that the majority of seepage pathways from the TSF and MRSFs are to the Open Pit; however, all scenarios have some seepage pathways that eventually reach the receiving environment in Peterson Creek (ERM 2016a). The GWQMMP relies on monitoring to verify the mitigation and management measures are adequate, perform as predicted in the effects assessment, and provide information for adaptive management if unanticipated effects on groundwater are discovered. Groundwater quality results will be compared against baseline ranges for each monitoring well, as well as generic water quality guidelines. For most parameters, action triggers will be developed for monitoring results that exceed generic water quality guidelines specific to the downstream users.
	ESCP (Section 11.2) Description: The ESCP has been established to manage mitigation approaches designed to prevent or minimize erosion and contain sediment within the mine site. The environmental protection measures associated with mitigation of erosion and sedimentation focus on: • Incorporation of erosion and sedimentation control into design and planning (e.g., minimize disturbance, progressive reclamation); • Application of erosion control BMPs (e.g., re-contouring stockpiles of soil and overburden to a 2H:1V slope and seeding for erosion control); • Application of sediment and runoff control BMPs (e.g., minimizing the area of exposed soils, timely seeding and	Implementation of Best Achievable Control Technology or management practices will minimize contaminants entering water bodies and decreasing the quality of fish tissue.	High By implementing a combination of measures, including soil erosion control, effects on water quality will be mitigated, contributing to maintaining fish quality. To ensure effectiveness of the mitigation measures, the ESCP relies on continuous monitoring to verify that the management practices are adapted to local conditions, are properly executed, and, if needed, more detailed site-specific prescriptions are completed. For example, areas affected by erosion will be mapped and information including erosion type, intensity, the extent of the affected area, site UTM coordinates, and existing control measures and an assessment of their performance will be documented. Affected sites will be regularly checked for evidence of erosion, particularly after rainfall events, until erosion is not a concern. Monitoring results will be used to trigger an appropriate adaptive management response. The effectiveness of the ESCP will be assessed regularly (at least annually). The reviews will reflect changes in environmental requirements, technology and operational procedures.

Factor	Mitigation Measure	Rationale for Inclusion	Effectiveness of Mitigation
	planting, and the use of erosion control measures appropriate to the soil erodibility potential in TSF); and • Monitoring and maintenance (e.g., sediment control and runoff management structure functionality will be maintained by removing sediment captured in traps before it exceeds 15% loss of trap capacity).		
	ML/ARD Management and Monitoring Plan (Section 11.5) Description: The purpose of the ML/ARD Management Plan is to formulate a series of operational procedures and closure activities that will avoid the development of acidic drainage from the Project MRSFs, TSF and ore stockpiles and minimize the impact of neutral metal leaching to the receiving environment from these facilities. Management strategies specific to the Project include: • Locate MRSFs to areas east and south of the Open Pit to increase distance from the City of Kamloops and facilitate collection of seepage; • Segregate high-risk versus low-risk rock types in the pit; • Blend PAG and NPAG materials in proportions appropriate to prevent ARD onset; • Construct an NPAG base for the blended MRSFs; • Limit infiltration by the implementation of a cover; • Minimize East MRSF size and construct it only of NPAG material to limit seepage over the Peterson Creek Aquifer; • Peterson Creek Diversion constructed to limit the quantity of contact water discharging to Peterson Creek; • In-pit backfill contains seepage and prevents discharge to receiving water streams; and • Use liner systems in the TSF where tailings are in contact with embankments to limit infiltration of tailings pore water.	Implementation of Best Achievable Control Technology or management practices will minimize contaminants entering water bodies and decreasing the quality of fish tissue.	<u>High</u> By implementing a combination of measures to prevent development of acidic drainage, negative effects on water quality (e.g., changes in pH and concentration of metals), and therefore on fish can be mitigated. Effective mitigation is achieved by addressing geochemical, hydrological and geotechnical factors of risks (BC MEM, 1998) through a diversity of measures. For example, blending PAG and NPAG mine rock might be an effective measure to prevent generation of acid drainage when comprehensive material characterization, waste design and construction plans are supported by detailed prediction information (BC MEM, 1998). Similarly, the use of a cover on waste rock piles is an effective measure to reduce water infiltration although quantification of effectiveness (e.g., 80% of infiltration prevented by a soil cover) depends on final design criteria. To ensure effectiveness of the mitigations, monitoring will include: in-pit monitoring and sampling (e.g., ore identification and management, segregation of PAG and NPAG mine rock), seepage and tailings slurry water quality monitoring, and commissioned of on-site laboratory.

Table 2: Hierarchy Used for Effectiveness of Mitigation Criteria

	Effectiveness Criteria
High	Built into Project design. Uses well established industry standard design/equipment, etc. Clear responsibility/oversight by qualified professional.
Moderate	Secondary level or in-direct measure. Potential challenges implementing or enforcing. Additional detail required to more clearly define this measure to increase confidence.
Low	Non-standard measure. Beneficial if successful; however, further research is required to develop details and increase confidence in this measure.

3.2 Assessment of Effects of the Project on Existing Trout Fishery

In consideration of protecting the Aboriginal fishery at the outlet of Jacko Lake, KGHM commissioned a study to identify alternatives to the Peterson Creek Diversion System that would avoid or reduce the impacts on Peterson Creek (Norwest 2016). The revised design of the Peterson Creek Diversion System avoids impacts along the 150 m where the asserted Aboriginal spring fishery occurs and prioritizes maintaining the productivity of the fishery.

KAM has proposed revised measures to offset impacts to fish and fish habitat, the details of which can be found the FHFOP (Knight Piésold Ltd., 2016b). The FHFOP reflects changes in Project design and substituted the previous Fish Habitat Mitigation Plan, abandoning the idea of creating a new fishery at Inks Lake. Instead, the FHFOP is aimed at protecting the fisheries where they currently exist in Jacko Lake and immediately downstream of Jacko Lake in Peterson Creek.

3.2.1 Updated Baseline Data

The revised assessment was completed using updated baseline information collected in May 2016. The data was obtained from a field assessment, surveys and observations. The results were in line with fish observations in previous years and were used to produce a conservative estimate of the numbers of fish in the fishery can be calculated to be 2 fish per m^2, multiplied by 100 m, for 4 weeks, which equals 800 fish.

3.2.2 Potential Effects of the Project on the Aboriginal Fishery

The potential effects of the Project on the Aboriginal fishery were identified in Section 8.5.5.3 Effects on Current Use of Land and Resources for Traditional Purposes of the Application/EIS. These effects remained unchanged in the revised assessment presented in the FHFOP. The potential effects of the Project on Aboriginal fisheries are the following:

- Change in the availability of fish;
- Change in access or ability to access or use fishing areas;
- Change in fishing experience (sensory disturbances); and
- Changes in the quality of fish.

3.2.3 Residual Effects of the Project on the Aboriginal Fishery

The Project was redesigned and avoidance and mitigation measures were applied to preserve the existing Aboriginal spring fishery. The proposed mitigation measures and their effectiveness have been identified in **Table 1** of this document and reflect the changes to Project design and the revised FHFOP. Although the potential effects on the trout fishery remain the same as with the previous Project design, the residual effects have changed as a result of the revised FHFOP. The main change between residual effects is in access, because the previous Fish Habitat Mitigation Plan did not allowed for access to the outflow of Jacko Lake, which is the location where the spring fishery occurs. For all other indicators, the residual effects remain the same. It is important to note that, since the SSN asserted spring trout fishery only occurs in the outlet of Jacko Lake, and no

other lakes offer this opportunity during the same period, alternative sites cannot be considered in the assessment of residual effects.

Characterization of Residual Effects

The overall magnitude of the residual effects on the Aboriginal trout fishery with the revised Project and FHFOP was rated minor, reflecting the individual ratings of residual effects, which are described in the following paragraphs. The characterization criteria, significance of effect, likelihood and confidence for the Aboriginal trout fishery are summarized in **Table 3**.

Availability of Fish

The magnitude of the residual effect is rated negligible, because the loss of fish habitat as a result of the Project will occur in a small area (northeastern arm of Jacko Lake and Middle Peterson Creek) of the Peterson Creek catchment but will be offset with implementation of the FHFOP. Based on the updated FHFOP, net losses due to the Project are calculated to be 51,051 habitat units in total, which are proposed to be offset by 67,151 habitat units. The net increase in surface area and storage volume in Jacko Lake, combined with proposed enhancements to Upper Peterson Creek, will at minimum maintain and potentially increase productive capacity and rearing habitat for rainbow trout in Jacko Lake *(*Knight Piésold Ltd., 2016b). In addition, the Project will not impede fishing rainbow trout in other areas of the catchment (i.e., Lower Peterson Creek and upper portions of Peterson Creek, including Jacko Creek).

The residual effects on fish availability will continue until cease of operation (long-term), will occur on a regular basis and will be limited to a local geographic extent. The effects can be reversible long-term after closure. The social value (context) is rated high, because of the importance of the fishery, particularly the Aboriginal spring fishery (e.g., as a source of protein during the early spring), and therefore resiliency to the effect was rated low. The FHFOP will be implemented, which will offset direct rainbow trout habitat loss by increasing rearing habitat for the stocked rainbow trout in Jacko Lake, maintaining the spring fishery at Jacko Lake outlet and restoring and enhancing rainbow trout habitat at Jacko Lake inlet *(*Knight Piésold Ltd., 2016b).

Access or Ability to Access or Use Fishing Areas

The magnitude of the residual effect is rated minor, because, although with the new FHFOP the access to the outlet of Jacko Lake where the fishery occurs and ability to use the area for fishing will be maintained, and even improved with the construction of a new road, boat launch, day-use area and shoreline trails for fishers, there will be still some limitations to fishing during blasting times, if fishing is intended within the blasting clearance area. This represents a reduction of fishing opportunities during blasting times.

The residual effects on access or ability to access or use the site will continue until cease of operation (long-term), will occur on a regular basis and will be limited to a local geographic extent. The effects can be reversible long-term after closure. The social value (context) is rated high, because of the importance of the Aboriginal trout fishery and, therefore, resiliency to the effect was rated low.

Fishing Experience (Sensory Disturbances)

The magnitude of the residual effect is rated minor, because, although there will be an increase in sensory disturbance (i.e., noise, dust and visual disturbance), it will be relatively small. For example, the highest level of noise disturbance will take place during sheet piling activities during the Construction Phase. Although the noise may affect the enjoyment of the fishing experience, it will last no longer than 2 months. Similarly, if visible, point sources of fugitive dust may affect the experience. A moderate degree of visual effect may result from Project infrastructure (e.g., MRSF and TSF) and be noticeable from Jacko Lake and Peterson Creek. All the sensory disturbance effects, however, are subjective to the user.

The residual effects on fishing experience will continue until cease of operation (long-term), will occur on a regular basis and will be limited to a local geographic extent. The effects can be reversible long-term after closure. The social value (context) is rated high, because of the importance of the fishing experience to Aboriginal fishers and, therefore, resiliency to the effect was rated low.

Characterization of Likelihood and Confidence

The likelihood of these residual effects to occur is high, because there will be a loss of access and fishing experience. Confidence in this prediction is medium, since mitigation measures are well understood, but the actual effect on fishing practices will also depend on personal preferences and choices, particularly with respect to changes in the fishing experience.

3.2.4 Conclusion of Assessment of Effects on the Aboriginal Trout Fishery

Based on the assessment of residual effects, it is anticipated that changes to the Aboriginal trout fishery will be not significant (minor). It is expected that, with the implementation of mitigation and offsetting measures, the SSN will continue to be able to harvest the same amount of fish (rainbow trout) and of the same quality. The main changes will be in access, which will be restricted during certain times of the day due to blasting, and changes in the fishing experience, because of noise and modifications of the visual landscape.

Table 3: Characterization of Residual Effects, Significance, Likelihood and Confidence on Current Use of Lands and Resources[1] for Aboriginal Fishery (rainbow trout spring fishery)

Residual Effect	Residual Effects Characterization Criteria							Significance of Adverse Residual Effects	Likelihood and Confidence	
	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Resiliency	Context		Probability	Confidence
Disruption of Aboriginal fishery use	Minor	Long-term	Regular	Local	Reversible long-term	n/a	High	Not significant (minor)	High	Medium

[1] For definitions of characterization criteria for residual effects in Land and Resource Use, refer to Table 8.4-8 in Section 8.4 of the Application/EIS.

3.3 Proposed Measures to Develop and Conduct the Follow-up Program in Consultation with the Stk'emlupsemc te Secwepemc Nation

KAM has noted that they are committed to developing the Project ensuring participation of the SSN. Measures to mitigate effects on the Aboriginal fishery have been detailed in **Table 1**. The following measures address direct participation of the SSN in developing and conducting the follow-up program for the mitigations proposed for the Aboriginal fishery:

- KAM will establish a committee with the SSN to facilitate implementation of mitigation and monitoring. The committee will foster the SSN's participation in understanding the effectiveness of the mitigation proposed on an ongoing basis.
- As detailed information regarding the seasonal round and intergenerational teaching becomes available, KAM will make reasonable efforts to accommodate working schedules for Aboriginal employees that engage in activities for traditional purposes. Also, as part of its corporate social responsibility policy, KAM will inform all employees of their duty to respect Aboriginal culture and practices.
- KAM will develop and implement an Access Management Plan in consultation with Aboriginal Groups that includes provision for safe access for SSN members to Jacko Lake during the Project life cycle.
- KAM will communicate with Aboriginal Groups regarding when blasting is likely to occur and demarcate those areas.
- KAM will work with the SSN and investigate the need for future studies on biodiversity and animal population trends in the region to determine the possible role of the Project or other industrial activities in future conditions as they relate to harvested species, including fish.
- KAM is committed to implementing a collaborative approach to reclamation with the SSN, which may include providing funding for ongoing reclamation research and incorporating SSN input.
- KAM will collaborate with the SSN to develop a monitoring program that includes an annual survey of SSN members or workshops with SSN resource harvesters to monitor the types, volume, locations and time spent harvesting traditional foods throughout the year.
- KAM will develop a human resource development plan to maximize local employment with the Project, taking into account the need for SSN members to participate in traditional harvesting activities during certain periods of the year.

KAM has expressed that they look forward to receiving feedback from the SSN about mitigations proposed during the next stages of the Project.

4.0 CONCLUSION

We trust that the information provided in this memorandum addresses the question or concern noted in Section 2.

Respectfully submitted,

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5.0 REFERENCES

Acts and Regulations

Contaminated Sites Regulation, BC Reg 375/96

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