Kemess Underground Application Review - TKN Issues Tracking Table - January 6, 2017

	For Working Group Use				For Proponent Use	
ID #	**Comment Date**	**Reviewer Name / Agency (i.e. Alex Kwang, MEM)**	**Subject (See "instructions" tab)**	**Comment (Include Memo reference as applicable)**	**Proponent Response (Include Memo reference as applicable)**	**Response Date**
TKN-000	29-Apr-16	TKN	Water (General)	**7. Failure to comply with s. 6.2.3.2 in relation to baseline hydrological conditions** Section 6.2.3.2 of the AIR sets out the required information for baseline hydrological conditions. In particular, it provides that the Application must synthesize hydrology documents relevant to the Project (including Kemess North studies, Kemess South baseline hydrology data, etc.). Source has identified that the Application fails to include flow data from the following components of the Kemess South mine drainage system: • KS TSF Dam embankment seepage; • KS TSF Dam embankment runoff; • KS TSF Dam foundation seepage; • KS TSF Dam spillway discharge; • KS Pit Highwall Runoff; and • KS Waste Rock Dump drainage. However, those Kemess South components are located within the Project's proposed drainage system. Source has therefore concluded that they will contribute flow into the Project's drainage system and, as a result, their loading contributions must be accounted for in, and used to calibrate, the Project's site-wide water balance and water quality model. Required action: Source has identified that AuRico should take the following steps to address these serious informational gaps in its Application: (a) AuRico must compile and include historical surface water data from the following Kemess South components as baseline hydrological information in the Application: • TSF Dam Seepage Recovery Ponds (flow rate / pump-out rate); • TSF Pond Water Surface Elevations (water levels); • Open Pit Water Surface Elevations (water levels); • Waste Rock Seepage (flow rate); and • Waste Rock Creek at WQ-14F (flow rate).	The response is provided in the memo **20160603_KEG Comment TKN-000_Hydrology_Memo**	3-Jun-16
TKN-001	26-Jun-16	SEA on behalf of TKN	Alternative Means	SEA (June 20, 2016) - Section 3.1.1 **Thickened Tailings with no East Dam** Overview AuRico assessed an option for deposition of thickened/paste/filtered tailings into the KUG TSF (Option 14 - 16, EAC application: Table 2-2, Appendix 4C). This option entailed the production of higher density tailings (compared with conventional tailings) whereby the East Dam would not be required. From a long-term management perspective, this option would be preferable to the East Dam option because it would eliminate the need for ongoing maintenance of a dam following mining operations. This option may also result in reduced surplus of water in the KUG TSF due to lower water content in the tailings slurry. AuRico ruled out this option because, according to the EAC Application, it would require complete dewatering of the open pit prior to deposition of tailings – which could lead to pit wall instability and water quality issues from the larger volume of pit water that would need to be released. SEA is concerned that the thickened tailings option was ruled out without sufficient consideration, particularly in light of the significant potential long-term benefits. EA Information Request: SEA recommends that AuRico complete the following: • Investigate any approaches that could result in a feasible thickened tailings / no East Dam option. For example: o Indicate whether the thickened tailings / no East Dam options can be modified to reduce safety hazards associated with pit wall instability (e.g., slower pump-out of the pit lake) and to reduce the potential for water quality issues (e.g., higher treatment rates, slower pump-out rate). o Indicate whether some water could be left in the pit lake when tailings deposition commences, while still avoiding the need for the East Dam.	It has been shown at other tailings facilities that thickened or paste tailings can be successfully deposited subaqueously with only some mixing and increased volume through beaching or tremie technologies. However, to eliminate the East Dam from the KUG TSF, the density of tailings required (over 85% solids content by weight) precludes these methods. The density required for a no dam option is at the upper limit of paste technology under ideal conditions, and is typically only achievable through filtering (dry stacking) of tailings. Therefore, to effectively develop a dry stack or paste tailings facility in the KS Open Pit, full dewatering of the pit would be required, otherwise any remaining water would mix with discharged tailings and increase their volume. Dewatering the pit within the project timeline would not be feasible from either an environmental or geotechnical safety standpoint, as the high discharge rate would cause adverse impacts to the receiving environment and potentially lead to instability of the pit walls. To safely dewater the pit would take a time scale of years, such as in the current design where dewatering takes place over a span of years as tailings are concurrently stored in the pit. Several years of additional dewatering and treatment beyond the already proposed construction water draw down prior to start-up of the project is not feasible from a project timeline or economic perspective. In addition, economic concerns related to the Capex and opex associated with thickened-filtered tailings, based on scoping figures provided by AMEC, would severely impact overall project economics.	5-Aug-16
TKN-002	26-Jun-16	SEA on behalf of TKN	Tailings and Waste Rock Management	SEA (June 20, 2016) - Section 3.1.2 TSF Water Management when the Proposed East Dam is in Place Overview If AuRico concludes that the East Dam is the only feasible method to store all tailings in the KUG TSF, a plan should be developed and implemented to prevent unnecessary accumulation of surplus water behind the East Dam during operations. This would reduce the potential for increased risk and dam instability issues associated with excess water storage. Proposed EAC Condition: If approved, SEA recommends the following as an EAC Condition to be met prior to, or during, the Mines Act permitting stage: • Set an objective for maximum allowable volume of water storage behind the East Dam, and demonstrate with the water balance and water quality model that it is achievable to maintain the pond below the water volume as well as water quality objectives in the receiving environment.	To reduce the volume of water impounded by the KUG TSF, upslope diversion ditches will be established, effectively limiting the inflows into the TSF to only direct precipitation and groundwater seepage. As well, the KUG TSF is afforded significant flexibility compared to other sites by the planned water treatment plant, which allows for excess water to be discharged to the environment without significant detriment and inflows above design to be accommodated. No guidelines for maximum allowable pond volume have been established or are planned to be established. Instead, strict limits on minimum freeboard and beach width are defined, which will effectively limit the pond volume to a safe quantity. The achievability of these limits has been demonstrated through water balance modeling for both within the TSF and the effect of discharge on the receiving environment, and the water level will be controlled through pumping, treatment, and discharge of pond water. Also, additional testing for beach materials is ongoing as per response below. Water volume to be stored is not a Certificate Condition.	5-Aug-16
TKN-002.1	7-Sep-16	SEA on behalf of TKN	Tailings and Waste Rock Management	Background: During Operations, a pond will be maintained in the TSF because a given minimum volume of water will be required for the mill water reclaim system. If the treatment system cannot keep up with the inflows to the TSF, there will be potential for build-up of water behind the East Dam during the final years of Operations. Excess water stored behind the dam can increase the likelihood and consequence of dam failure. Recommendation: SEA recommends that an EAC Condition be developed to limit the volume of water allowed behind the East Dam at a given time.	with EAO	28-Oct-16
TKN-003	26-Jun-16	SEA on behalf of TKN	Tailings and Waste Rock Management	SEA (June 20, 2016) - Section 3.1.3 Extended Beach Concept Overview AuRico determined that the preferred option from the alternatives assessment was the storage of tailings and waste rock in the KUG. The East Dam would be constructed with crest elevation about 25 m above the pit rim for additional storage. Sections 5 (Project Description) and Section 6 (Reclamation and Closure Plan) of the EAC Application described the post-closure KUG TSF as having a beach to separate the KUG TSF Pond from the East Dam by a distance of 300 m. Appendix 3 of the Tailings Alternatives Assessment Report included a report by AMEC titled "Kemess Underground Project - Application of Best Available Technologies for Tailings Storage", dated December 1, 2015. That report identified a larger beach as a BAT for tailings storage. The report presented the concept of an extended (800 m wide) tailings beach to reduce the potential for erosion of tailings in the event of a breach of the East Dam. The Tailings Alternatives Assessment Report stated that AuRico is presently investigating the feasibility of extending the non-acid generating (NAG) tailings beach to improve the stability of the dam by minimizing the pond water volume and creating a longer beach between the dam and the water body. However, the extended beach concept was not presented in the main body of the EAC Application. Proposed EAC Condition If approved, SEA recommends the following as an EAC Condition to be met prior to, or during, the Mines Act permitting stage: • Complete a feasibility study for the extended beach concept.	Geochemical assessment of the KUG tailings is ongoing to determine if the NAG tailings beach can be extended. This includes both humidity cell and saturated column cell testing of Black Lake intrusives and Takla lithologies. This evaluation will determine the volume of sand that can be generated as suitable subaerial beach material during the final years of mine operations, which in turn directly dictates the final beach configuration options. Final beach configuration is not a Certification Condition.	5-Aug-16
TKN-003.1	7-Sep-16	SEA on behalf of TKN	Tailings and Waste Rock Management	Background TKN would like an EAC Condition such that AuRico will be committed to evaluation of the feasibility of the extended beach concept, and its implemention, should it be deemed feasible. Proposed EAC Condition: If approved, SEA recommends the following as an EAC Condition: Complete a feasibility study for the extended beach concept that was introduced in Section 3.1.3 of the EAC Application. If the extended beach concept is deemed to be feasible, incorporate the exteneded beach into the mine design prior to, or during the Mines Act permitting stage.	with EAO	28-Oct-16
TKN-004	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.2.1 Post-Closure Treatment Costs Overview AuRico expects that no water treatment will be required following mine closure (i.e., during post-closure). If treatment is required post-closure, the proposed treatment system will likely be too expensive to run in the long-term. Proposed EAC Condition If approved, SEA recommends the following as an EAC Condition: • Develop a contingency plan for long-term treatment. Consider passive or semi-passive methods such as wetlands or bioreactors in the selection of contingency treatment because those technologies are typically less costly than active systems.	Treatment has been committed to until it is no longer required to achieve acceptable discharge water quality and the estimation of continuing treatment for the closure period is based upon water quality model predictions. However, given reduced water treatment volumes associated with post-closure, it is expected that the proposed selenium and metals removal water treatment plants could be run during post-closure over the approximate 6 month discharge period. If less expensive treatment options exist, they will be considered. Treatment duration is not a Certificate Condition.	5-Aug-16

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TKN-004.1	7-Sep-16	SEA on behalf of TKN	Water (Quality & Treatment)	Background: According to Section 6.7.3 (Water Treatment Costs) of the Closure Plan, post-closure treatment costs were estimated for six years of treatment during the Closure Phase, and for no years during the Post-Closure Phase. AuRico stated (in their response to TKN-004) "Treatment has been committed to until it is no longer required to achieve acceptable discharge water quality and the estimation of continuing treatment for the closure period is based upon water quality model predictions". Long-term water treatment may be required to meet water quality levels that are acceptable to TKN (e.g., such as BC water quality guidelines for selenium in Waste Rock Creek). The project planning should include long-term water treatment to meet these protection levels. Recommendation: An EAC Condition should be explored that requires long-term water treatment be designated and costed for ongoing Post-Closure water treatment to meet TKN's water quality objectives.	with EAO	28-Oct-16
TKN-005	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.2.2 Cost Estimate for the Proposed Selen-IX Treatment System Overview Generally, the cost estimate presented in Appendix 5C of the EAC Application is on the low end of industry-wide cost estimates. The North American Metals Council - Selenium Working Group (2013) recently compiled cost curves for various technologies to remove selenium from mine waters. For ion-exchange, they reported that systems treating 800 gpm (close to the design flows at KUG) average capital costs of $40 million (USD) and operating costs of $5 million (USD). These are significantly higher costs than those reported by AuRico in Appendix 5C of the EAC Application. EA Information Requirement SEA recommends that AuRico complete the following: • Retain an experienced third party to review and confirm the validity of the cost estimates reported in Appendix 5C of the EAC Application.	In the 2013 NAMC-SWG report ion exchange (IX) was presented as a low risk, commercially proven technology. However, the IX system described by this report did not involve regenerant brine recycle and instead relied on evaporation-crystallization of brine followed by landfilling of the crystallized salt. Evaporator-crystallizer systems are very expensive both in terms of capital and operating cost. In the Selen-IX system we re-use the regenerant brine and so there is no liquid waste that requires crystallization. As a result, the Selen-IX system is not only significantly less expensive than the IX system described in the NAMC report but it is also less complex in that there is no need to manage the high temperatures/pressures required by crystallization. This major process difference is the main source of the cost differential between Selen-IX and the IX system described in the NAMC report. BioteQ is now a member of the NAMC-SWG and so this group is now aware of Selen-IX unlike in 2013 when CH2M Hill authored their report.	5-Aug-16
TKN-006	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.2.3 Supplementary Test Results Required Overview The pilot campaign described in Appendix 5C (Pilot Demonstration of Selenium Removal from AuRio Kemess Pit Water Using Selen-IXTM, BioteQ, January 29, 2016) was designed to produce the parameters to design and cost a full-scale treatment system. Unfortunately, the trial runs could not be operated continually due to the small volumes of eluate produced. This is acceptable from the standpoint of developing the design parameters, but is not from the standpoint of identifying operational issues. In particular, problems may appear after prolonged use of the eluate treatment circuit in a continual mode, but not in a batch mode. This is because the possible build-up of solutes in regenerant solution or deposits on electrodes is gradual and fouling problems will only appear after prolonged, continual use. Electrode fouling is the main problem, and the main cause of failure, with electrocoagulation systems. To obtain credible information about the reliability and cost of this treatment system, the regenerant circuit needs to be operated in a continual mode, not batch mode. EA Information Requirement SEA recommends that AuRico complete the following: • Provide supplementary test results from a test run under continuous treatment. • Closely monitor the regenerant solution for the accumulation of solutes whose build-up may cause failure of the ion-exchange cells or the electrocells (notably, the composition of the regenerant solution was not provided in the EAC Application). Require BioteQ to indicate its composition to allow an evaluation of its potential effect on the electrodes of the electrocell.	BioteQ agrees that the pilot did not (and could not) demonstrate continuous operation of the electrocells due to the high efficiency of IX resin producing too small of a volume of spent regenerant for processing in the electrocells. That said, the intermittent nature of the electrocell operation most likely represented the worst case scenario for the full scale plant operation. This is due to the fact that starting and stopping the EC circuit and maintaining the iron electrode surface active during prolonged periods of inactivity is worse than operating the EC cells continuously. The reviewer is correct that electrode fouling is known to occur in electrocoagulation systems. However, the operating conditions in the Selen-IX EC cells and the composition of the solute/slurry treated in these cells are very different indeed from the operating conditions of electrocoagulation cells and solutes treated by them, respectively. The reasons for low risk of electrode fouling in Selen-IX are discussed further in response to TKN-008.	5-Aug-16
TKN-007	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.2.4 Performance of Proposed Sludge Settlement Process Overview An XRD analysis of the solid residue identified various iron species in the sludge (EAC Application: Table 6-2, Appendix 5C, Pilot Demonstration of Se Removal), but the analysis did not quantify amorphous iron oxides/oxyhydroxides, which may comprise the bulk of the iron in this sludge. These amorphous iron compounds are significantly more difficult to separate than the other forms, and they may not separate easily in the proposed decant tank and filter press circuit. Other processes, including addition of flocculants and gentle agitation, may be more suitable to settle this kind of residue. EA Information Requirement SEA recommends that AuRico complete the following: • Conduct further testing to demonstrate that a decant tank/filter press will be adequate to settle the sludge generated by the electrocell.	The iron selenium solids settled well in the pilot. Several measurements of solids settling rate were made during the campaign to confirm the rise rate for sizing the clarifier for the full scale plant. The design of the full scale plant is based on the rise rate of 1.5 m/hr which is a much lower than measured during the campaign (conservative sizing). The fast settling of iron solids is consistent with BioteQ's experience from previous pilots. There is no need for further testing.	5-Aug-16
TKN-008	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.2.5 Potential for Fouling of the Electrodes Overview The characterization of the solid residue presented in the EAC Application (Table 6-1, Appendix 5C, Pilot Demonstration of Se Removal) showed that substantial amounts of calcium and magnesium were precipitated. These elements may have been stripped off the ion-exchange resins and may build up in the regenerant brine, which may result in long-term fouling of the electrodes in the electrocell. EA Information Requirement SEA recommends that AuRico complete the following: • Require BioteQ to present the composition of the regenerate brine, identify its source of calcium and magnesium and determine if their build-up will result in electrode fouling during continual operation of the electrocell.	The ion exchange resin used in Selen-IX is a strong base anion. It follows that cationic species such as Mg and Ca are not adsorbed onto the resin and simply pass through the system. That said, small amounts of Mg and Ca get carried over from plant feed into the regenerant solution during resin rinsing. Contrary to reviewer's expectations, neither Mg nor Ca can build-up uncontrollably in the system. The Ca level in the regenerant is controlled by the level of bicarbonate (carried over from plant feed) which is turned into calcite in the eluate circuit operating at pH 9, and by the solubility limit of gypsum in concentrated Na_2SO_4 solution which is used as the IX regenerant. The Mg level in the regenerant is controlled by the $Mg(OH)_2$ solubility. Furthermore, the electrocells operate at a high concentration of suspended solids ~ 5 to 10 g/L. These solids have a very high surface area and act as the seed for calcite, gypsum, and/or $Mg(OH)_2$ solids. Finally, the relatively high fluid velocity across the EC and the open design of the EMEW style EC minimizes the risk of solids deposition on either electrode. The composition of the regenerant was measured during the pilot and can be presented if necessary.	5-Aug-16
TKN-009	26-Jun-16	SEA on behalf of TKN	Closure and Reclamation	SEA (June 20, 2016) - Section 3.3.1 First Nations for Closure Plan Overview AuRico intends to provide a detailed assessment for closure costs and a detailed monitoring program at the Mines Act permitting stage. Proposed EAC Condition If approved, SEA recommends the following as an EAC Condition: • Grant TKN a meaningful opportunity to review and provide input on the RCP as it is developed.	AuRico continues its ongoing communication and dialogue with TKN leadership and includes such topics as TKN participation during the KUG permitting process and RCP preparation (i.e. included as part of IBA). There is no need to set as Certificate Condition.	5-Aug-16
TKN-009.1	7-Sep-16	SEA on behalf of TKN	Closure and Reclamation	Background: TKN appreciates the level engagement that AuRico has provided to TKN to date. While TKN believes that AuRico will continue to involve TKN in relevant project issues in the future, there is the possibility that another owner will take over the mine and become the holder of the EAC at some future date. For that reason, First Nations engagement should be written into the EAC Conditions such that any future EAC Holder will be required to involve TKN in decision making in terms of environmental management issues that could affect TKN interests. Recommendation: The EA Conditions should state that that the EAC Holder shall make reasonable effort to engage the TKN prior to submission of the required monitoring plans and mine design revisions that will be required for permitting.	with EAO	28-Oct-16
TKN-010	26-Jun-16	SEA on behalf of TKN	Closure and Reclamation	SEA (June 20, 2016) - Section 3.3.2 Contingency Costs for an Extended Treatment Period during Closure Overview AuRico estimated that the KUG mine closure and reclamation costs will be a total of $33.17M of which $13.62 million was intended for water treatment for six-year closure phase. EA Information Requirement SEA recommends that AuRico complete the following: • Describe contingency plans and costing for the possible scenario where water treatment would be needed following closure for longer than six years.	Treatment has been committed to until it is no longer required to achieve acceptable discharge water quality and the estimation of continuing treatment for the closure period is based upon water quality model predictions. However, given reduced water treatment volumes associated with post-closure, it is expected that the proposed selenium and metals removal water treatment plants could be run during post-closure over the approximate 6 month discharge period. If less expensive treatment options exist, they will be considered. Also see line 9 above for additional treatment considerations upon closure.	5-Aug-16
TKN-011	26-Jun-16	SEA on behalf of TKN	Closure and Reclamation	SEA (June 20, 2016) - Section 3.3.3 TKN Involvement in Post-Mining Monitoring Overview AuRico provided conceptual monitoring programs for reclamation areas, groundwater, surface water, environmental effects, and geotechnical structures. The general approach will be to monitor locations where there is the greatest potential for effects from project infrastructure and determine if mitigation measures will be required. Monitoring will continue until receiving environment objectives are met. EA Information Requirement SEA recommends that AuRico complete the following: • Describe how during and after the six-year closure phase AuRico will involve TKN in reclamation activities, regular maintenance, monitoring and reporting.	AuRico continues its ongoing communication with TKN leadership which includes TKN participation in monitoring during operations and closure. TKN members will be employed directly by AuRico for monitoring and reporting activities. TKN members will be members of the Environmental Management Committee. TKN businesses are expected to be used to carry out reclamation activities.	5-Aug-16

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TKN-012	26-Jun-16	SEA on behalf of TKN	Geochemistry	SEA (June 20, 2016) - Section 3.4.1 Supporting Data for Upper Bound Adit Decline and Ventilation Shaft Overview The selection of samples with 25th percentile neutralization potential (NP) and 75th percentile total-sulphur were described to represent the upper case source terms for the adit decline and ventilation shaft (EAC Application: Appendix 7E, Section 3.2.1). However, the 25th percentile and 75th percentile statistics were not presented. EA Information Requirement SEA recommends that AuRico complete the following: • Provide the 25th and 75th percentile statistics in the summary table (Table 3-2) to demonstrate the suitability of those values for the purposes of the upper case scenario modelling.	The response is provided in memo **20160809_KUG Comment TKN_012-026_Geochemistry_memo.**	9-Aug-16
TKN-013	26-Jun-16	SEA on behalf of TKN	Geochemistry	SEA (June 20, 2016) - Section 3.4.2 Comparison of Leach Test Pad Samples to their Respective Rock Units Overview Static data for the field test pad samples (EAC Application: Table 2-7, Appendix 7F) should be compared with static data from all other samples collected from the same rock unit (Gossan, Takla, etc.) to demonstrate how a given test pad sample fits in with the full set of samples that were collected for that rock unit. EA Information Requirement SEA recommends that AuRico complete the following: • Present the static data for each field bin sample with statistical summary (e.g., min, P5, P25, P50, P75, P95, max) of all samples within the rock unit for that field bin. Include acid base accounting (ABA) results and metals content.	The response is provided in memo **20160809_KUG Comment TKN_012-026_Geochemistry_memo.**	9-Aug-16
TKN-014	26-Jun-16	SEA on behalf of TKN		SEA (June 20, 2016) - Section 3.4.3 Results Figures 5-1 to 5-9 Overview The results presented in the EAC Application (Section 5, Appendix 7E, Figures 5-1 to 5-9) did not include pH or alkalinity. Those are standard parameters and should be presented. Where applicable, the BC Contaminated Sites Regulation (CSR) standards and the Canadian Council of Ministers of the Environment (CCME) guidelines should also be included in the results figures. Providing these as comparisons provides a benchmark for predicted concentrations. If applicable, Metal Mining Effluent Regulation (MMER) standards should also be included. Other useful benchmarks could include site monitoring data, geochemical test data, or other information on current conditions. EA Information Requirement SEA recommends that AuRico complete the following: • Include pH, alkalinity, and applicable benchmarks in the results figures in Section 5, Appendix 7E of the EAC Application. • Include applicable benchmark information in the results figures in Section 5, Appendix 7E of the EAC Application – such as: CSR, CCME, MMER, analogue data, or appropriate information on current conditions.	The response is provided in memo **20160809_KUG Comment TKN_012-026_Geochemistry_memo.**	9-Aug-16
TKN-015	26-Jun-16	SEA on behalf of TKN	Geochemistry	SEA (June 20, 2016) - Section 3.4.4 Sources of Total-S Overview Data presented in the EAC Application indicates that sulphide-S is not equal to total-S, and additional sources of total-S were present in the samples (EAC Application, Section 2.3, Appendix 7E). There is also a significant amount of insoluble-S. Little interpretation was provided regarding the potential source of insoluble-S (e.g., anglesite, barite, molybdenite, alunite). It is also unclear from the EAC Application what the high sulphate content signified geochemically. The solubility of sulphate minerals can vary considerably, depending on oxidizing conditions. Sulphates could indicate gypsum (source of sulphate) or hydrated iron sulphates with high solubilities. It is also important to understand which sulphates are present when establishing time to NP deletion, as consumption and production rates may change significantly with time. EA Information Requirement SEA recommends that AuRico complete the following: • Include additional interpretation regarding sulphides and sulphates in the EAC Application. Assumptions should be supported with mineralogy and humidity cell data.	The response is provided in memo **20160809_KUG Comment TKN_012-026_Geochemistry_memo.**	9-Aug-16
TKN-016	26-Jun-16	SEA on behalf of TKN	Geochemistry	SEA (June 20, 2016) - Section 3.4.5 Neutralization Potential (NP) and Time to Onset of ARD Overview Static geochemistry data were presented in the EAC Application (Section 2.3, Appendix 7E). A key assertion for source term development was that acidic drainage will not develop during mine life. It therefore becomes critical to understand available NP. The EAC Application indicated that "The CaNP is subsequently compared with the Sobek NP for each sample, where the smaller of the two values is conservatively used for the calculation of the net potential ratio". However, it is not clear which samples were based on CaNP and which were based on the Sobek NP method. EA Information Requirement SEA recommends that AuRico complete the following: • Include a figure of Sobek NP vs CaNP and total carbon vs organic carbon for each rock unit.	The response is provided in memo **20160809_KUG Comment TKN_012-026_Geochemistry_memo.**	9-Aug-16
TKN-017	26-Jun-16	SEA on behalf of TKN	Geochemistry	SEA (June 20, 2016) - Section 3.4.6 Time to Onset of Acid Generation Overview The time to NP depletion was discussed in the EAC Application (Section 4.4.5.1, Appendix 7-E). All source terms (with the exception of flow through the Gossan) were represented under the assumption that they will have neutral drainage. However, if acidic conditions do develop in any rock unit, those neutral drainage source terms will not be applicable. The initial NPs of the samples were elevated relative to the median NPs of all samples in the static test dataset. The median NP for the Takla unit was 8.4 kg CaCO3/t. The initial NPs in the test materials for the Takla unit were 52 kg CaCO3/t and 16 kg CaCO3/t. The median NP for the hypogene unit was 13 kg CaCO3/t and the max was 69 kg CaCO3/t. The initial NP in the hypogene test material was 63 kg CaCO3/t, which is very close to the maximum amount of available NP. To be conservative, tests should be carried out on samples that have an initial NP at or below median value for a given rock unit. Once available NP is consumed, the sulphide oxidation rate will accelerate (via bacterial mediated reactions), releasing metals. The pH will depress, which will also act to release metals previously bound to mineral surfaces and alter the stability of some minerals. If acidic conditions develop in the underground, this could drive preferential depletion or occlusion of available NP along the flow path and could promote additional acid rock drainage / metal leaching (ARD/ML). EA Information Requirement SEA recommends that AuRico complete the following: • Only total-S content was provided in the report (Table 4-7). Present insoluble-S, sulphate-S, and sulphide-S data. The samples should be representative of the high sulphide content (up to 8%) associated with the site. • Revise the derivation of the time to NP depletion with additional kinetic test information to support the current assumption that ARD will not develop during operations and closure. The tested sample material should have an NP content representative of between the median and minimum site wide estimates and the sulphide-S content of the material should be identified. Mineralogy for this material should also be provided.	The response is provided in memo **20160809_KUG Comment TKN_012-026_Geochemistry_memo.**	9-Aug-16

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TKN-017.1	7-Sep-16	SEA on behalf of TKN	Geochemistry	Background: The ABA information presented by Lorax in the response is not consistent with ABA presented in the past or as part of Issue ID#19. For example, in Table 3-7 of the Kemess Underground project - Water Quality Prediction for Mine Workings - Source Term Developement dated Feb 26, 2015, Lorax indicated that the median CaNP of the unit is 0.01. AuRico assumed that two of the potentially acid generating rock units at site (Takla and Hypogene) will not become acidic. If this assumption is incorrect and some of those rock units do become acidic, the water quality at site will be worse than what was presented in the EAC Application. During the August 22, 2016 working group meeting, Lorax (on behalf of AuRico) agreed to carry out additional geochemical assessment and provide results to the working group in response to SEA's concerns that the underground rock may become acidic faster than anticipated. SEA understands that the conceptual model will be further developed for oxygen ingress into the Takla unit for unsaturated conditions during mine dewatering. One pathway forward may be to provide an upper bound for geochemical loadings in the event that time to onset of acidic conditions is within the timeframe of the mining operations. The working group is awaiting a response from Lorax/AuRico on the proposed approach going forward. Information Requirement: Given the low CaNP of the unit and the complicated conceptual model and associated uncertainty, SEA requests the following items be addressed (note that contingency measures can be developed if appropriate): • The possibility that ARD will develop in the decline and the associated implications, if any. • The possibility for localized NP depletion along preferential flow paths in the subsidence zone as a result of flushing of the acidic Gossan drainage and/or increased sulphide oxidation, and associated implications, if any.	The response is provided in the memo **20161110_KUG_Comments_SEA 2_Geochem_Lorax Memo**	10-Nov-16
TKN-017.1 (continued)	7-Sep-16	SEA on behalf of TKN	Geochemistry	• Potential for the takla unit to be exposed to oxygen from the gallery during block caving and associated implications, if any. • The potential influence of soluble Fe(III) (in pH less than 3) on geochemistry along the flow path. • The potential for reduced metals to be present in the anoxic portions of the subsidence zone and implications such as reduced precipitation of some secondary minerals, potential oxidation of metals along the flow path near the gallery, potential for reductive dissolution and release of metals on closure. • An explanation of the slow sulphate production rate in the flood leach columns and possibility of silicate NP contributing to overall NP due to the slow sulphide oxidation rate and low drainage pH in the columns and how/if that relates to the Takla unit as a whole. • Explanation as to why the Takla unit between KS and KUG is significantly different but hypogene units are similar.	The response is provided in the memo **20161110_KUG_Comments_SEA 2_Geochem_Lorax Memo**	10-Nov-16
TKN-018	26-Jun-16	SEA on behalf of TKN	Geochemistry	SEA (June 20, 2016) - Section 3.4.7 Gossan Sample Selection for Column Testing Overview Static test results for the sample that was selected to represent the Gossan rock unit for kinetic testing were presented in the EAC Application (Table 3-5, Appendix 7E). The kinetic test sample did not appear to be similar to the Gossan samples that were selected for ABA testing. Solid state metal, total sulphur, and sulphide sulphur content were lower than the median among the samples from the static dataset. Copper content was lower than the minimum value from the static dataset, and sulphide-sulphur was only slightly higher than the minimum value from the static dataset. EA Information Requirement SEA recommends that AuRico complete the following: • Justify the selection of the Gossan sample, or re-do the laboratory analysis using a more representative sample. Update the water quality model to reflect any corresponding revisions to the Gossan source term.	The response is provided in memo **20160809_KUG Comment TKN_012-026_Geochemistry_memo.**	9-Aug-16
TKN-018.1	7-Sep-16	SEA on behalf of TKN	Geochemistry	Background: SEA understands and appreciates the limitations involved with sampling the Gossan material and agrees with using all available information when evaluating source terms. Information Requirement: Include the results from all field bins and all groundwater wells in the assessment (including KN09). Lorax indicated in the working group meeting (August 22, 2016) that they would consider all sources not currently incorporated.	The response is provided in the memo **20161110_KUG_Comments_SEA 2_Geochem_Lorax Memo**	10-Nov-16
TKN-019	26-Jun-16	SEA on behalf of TKN	Geochemistry	SEA (June 20, 2016) - Section 3.4.8 Static Data Summary for Samples within the Impacted Zone Overview The ABA samples were originally collected for the Kemess North EA; as such, there are likely some samples that fall outside the zone that will be affected by block cave mining from the KUG. EA Information Requirement SEA recommends that AuRico complete the following: • Develop a figure to show which static test samples fall directly within the area of impact (i.e., the subsidence zone) compared to which samples were not located within the area of impact. • Create a statistical summary of the static test samples that fall within the area of impact.	The response is provided in memo **20160809_KUG Comment TKN_012-026_Geochemistry_memo.**	9-Aug-16
TKN-020	26-Jun-16	SEA on behalf of TKN	Geochemistry	SEA (June 20, 2016) - Section 3.4.9 Solubility Control Modelling Overview Many of the source terms reflect loading under solubility controlled conditions (i.e., loadings have reached a constant state and are independent of mass loading). Identification of the minerals controlling solubility would increase the transparency of the source term development methodology. EA Information Requirement SEA recommends that AuRico complete the following: • Identify secondary mineral precipitates and incorporate them into the geochemical assessment and source term development process. • Demonstrate using PHREEQC analysis that the source terms are appropriate given the input assumptions.	The response is provided in memo **20160809_KUG Comment TKN_012-026_Geochemistry_memo.**	9-Aug-16
TKN-020.1	7-Sep-16	SEA on behalf of TKN	Geochemistry	Background: Answer provided for copper but should be expanded for other minerals. Information Requirement: Expand the response to include other minerals. Potential for a change is redox conditions along the flow path during operations and closure should be considered during operations and closure. Contingency measures can be developed if significant uncertainty exists with source terms.	The response is provided in the memo **20161110_KUG_Comments_SEA 2_Geochem_Lorax Memo**	10-Nov-16
TKN-021	26-Jun-16	SEA on behalf of TKN	Geochemistry	SEA (June 20, 2016) - Section 3.4.10 Source Term for Flushing of the Underground Overview It is possible that secondary minerals will form on the walls of the workings and within the subsidence zone during operations. As the environment changes to subaqueous, these metals may be flushed through the system (one time flush). Flushing of minerals was included in the assessment presented in the EAC Application. EA Information Requirement SEA recommends that AuRico complete the following: • Develop a source term to be included in the water quality model that accounts for the build-up and flushing of accumulated minerals from the surface of the fractured rock.	The response is provided in memo **20160809_KUG Comment TKN_012-026_Geochemistry_memo.**	9-Aug-16

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TKN-022	26-Jun-16	SEA on behalf of TKN	Geochemistry	SEA (June 20, 2016) - Section 3.4.11 Blasting Source Term Overview Nitrogen species concentrations presented in the EAC Application (Appendix 7E) were based on an analog site data. The use of analog data is appropriate for validation purposes. However, the source term should be derived from ammonium nitrate/fuel oil (ANFO) and blasting specific to the KUG site. EA Information Requirement SEA recommends that A9uRico complete the following: • Estimate the source terms for nitrogen species using site specific data. • Use analog data to validate the source terms (rather than to derive them), unless the analog concentrations can be demonstrated to be sufficiently conservative.	The response is provided in memo **20160809_KUG Comment TKN_012-026_Geochemistry_memo.**	9-Aug-16
TKN-023	26-Jun-16	SEA on behalf of TKN	Geochemistry	SEA (June 20, 2016) - Section 3.4.12 Pit High Wall Source Term Overview High wall source term development was explained in the EAC Application (Appendix 7F). The source terms were approximated using field test pad data and were applied to the block model developed for the exposed pit walls. There was no discussion of ARD from potentially acid generating (PAG) rock types Takla and Hypogene in the EAC Application. EA Information Requirement SEA recommends that AuRico complete the following: • Include the expected lag times to onset of acid generation of the Takla and Hypogene units. • Explain how acidic source terms were derived and accounted for in the water quality model.	The response is provided in memo **20160809_KUG Comment TKN_012-026_Geochemistry_memo.**	9-Aug-16
TKN-023.1	7-Sep-16	SEA on behalf of TKN	Geochemistry	Background: During the August 22, 2016 working group meeting, Lorax (on behalf of AuRico) agreed to carry out additional geochemical assessment and provide results to the working group in response to SEA's concerns that the PAG wall rock may become acidic faster than anticipated. Information Requirement: AuRico should either revise their water quality model to account for some acidification of the wall rock, or demonstrate with analytical results from representative rock samples that its assumption (i.e., non-acid generating rock) is correct.	The response is provided in the memo **20161110_KUG_Comments_SEA 2_Geochem_Lorax Memo**	10-Nov-16
TKN-024	26-Jun-16	SEA on behalf of TKN	Geochemistry	SEA (June 20, 2016) - Section 3.4.13 Verification of Lateral Flow Source Term in the Hypogene Unit Overview The lateral flow into the Hypogene unit was described in the EAC Application (Section 4.2.2, Appendix 7E), and the initial flush concentrations for leach tests and field bins were presented. Sulphate levels indicated that the resulting source terms were close to gypsum saturation. It would be useful to compare these data against the average and 95th percentile of groundwater sampled from this zone. This will help demonstrate that estimates are conservative. EA Information Requirement SEA recommends that AuRico complete the following: • Compare the source terms for lateral groundwater quality with groundwater quality data to demonstrate that the estimates for neutral drainage are conservative.	The response is provided in memo **20160809_KUG Comment TKN_012-026_Geochemistry_memo.**	9-Aug-16
TKN-025	26-Jun-16	SEA on behalf of TKN	Geochemistry	SEA (June 20, 2016) - Section 3.4.14 Uncertainty in Source Terms Overview Appendix 7E (Section 4) and Appendix 7F (Section 3) outlined the assumptions that went into source term development. However, a discussion on how those assumptions could impact water quality predictions was not provided. EA Information Requirement SEA recommends that AuRico complete the following: • Provide a discussion of uncertainties associated with the source terms. • Describe the reasons for the uncertainties and potential adverse effects to water quality predictions and mitigation systems for the KUG.	The response is provided in memo **20160809_KUG Comment TKN_012-026_Geochemistry_memo.**	9-Aug-16
TKN-025.1	7-Sep-16	SEA on behalf of TKN	Geochemistry	Background: The report would benefit from a discussion of potential uncertainties associated wtih source term development. SEA understands that Lorax has used the available information in an appropriate manner; however uncertainties will always exist for any prediction. Information Requirement: Describe the uncertainties associated with source term development such as potential for localized acidic conditions, preferential flow paths, the presence of faults, etc. Describe how the proposed mitigation systems for the project will be able to handle the range of geochemical condtions associated with the uncertainties.	The response is provided in the memo **20161110_KUG_Comments_SEA 2_Geochem_Lorax Memo**	10-Nov-16
TKN-026	26-Jun-16	SEA on behalf of TKN	Geochemistry	SEA (June 20, 2016) - Section 3.4.15 Formatting Review Overview The EAC Application contains various formatting errors that should be corrected to ensure clarity in findings and usefulness for future use. Comments: SEA identified various formatting matters during the review of the EAC Application. These are described below, along with specific recommendations to AuRico: • In Appendix 7E (page 3-5), Figure 3-11 is referenced; however, the reference should be Figure 3-2. • In Appendix 7F (page 3-12), a reference is made to "Table XX". • In Appendix 7E, Figures 2-24 to 2-30 are labelled as "Takla", but should be labelled as "Hypogene". Figure 2-32 to Figure 2-34 are labelled as "Takla", but should be labelled as "Decline Samples". • In Appendix 7E, Table 2-2 appeared to be out of place in the Section 2.2.1.2 (Gossan ABA). • Defining the water table is essential to the conceptual model of the site because material below the water table is generally subaqueous and oxygen ingress will be limited. Material above the water table could be subject to further oxidation, depending on consumption rates impacting the advective and diffusive flux of oxygen from surface.	The response is provided in memo **20160809_KUG Comment TKN_012-026_Geochemistry_memo.**	9-Aug-16

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TKN-027	26-Jun-16	SEA on behalf of TKN	Water (Ground)	SEA (June 20, 2016) - Section 3.5.1 Additional Groundwater Monitoring Requirements Overview It is imperative that adequate monitoring systems are in place to monitor groundwater conditions, and project effects thereon. Proposed EAC Condition: If approved, SEA recommends the following as an EAC Conditions: • Add the following monitoring systems to the existing groundwater program proposed in the EAC Application: a) Install overburden or shallow bedrock groundwater monitoring wells adjacent to water bodies in the East Cirque catchment. The intent of these wells would be to monitor current groundwater levels and to monitor the levels throughout the life of the mine. b) Install overburden or shallow bedrock ground water monitoring wells to evaluate vertical gradients and connectivity between overburden, shallow bedrock, and deeper bedrock units. c) Install nested groundwater monitoring wells outside of the subsidence zone (particularly to the east of the subsidence zone) to monitor the drawdown and groundwater quality throughout the life of mine and to act as background water quality wells. d) Install dataloggers in groundwater monitoring wells situated downstream of the subsidence zone in the East Cirque catchment (including, at minimum, wells DH-03-14 that and DH-03-15) to monitor levels throughout the life of the mine. e) Install monitoring wells at the inlet of the decline portals to monitoring groundwater quality. • Install the groundwater monitoring system (described in the EAC Application, and upgraded in accordance with the above recommendations) prior to commencement of mining activities, with sufficient time to evaluate and confirm current conditions (baseline). • Ensure that the groundwater monitoring system remains in place throughout the life of mine so that adverse effects and impacts can be evaluated throughout that period of time, and closure plans revised accordingly and promptly (as needed).	The Proponent acknowledges that the monitoring plan will be refined during permitting and will work with agencies to arrive at a suitable monitoring plan capable of characterizing any long-term effects from the Project, and will consult with TKN during development of these plans.	22-Aug-16
TKN-027.1	7-Sep-16	SEA on behalf of TKN	Water (Ground)	EAO to discuss the need for conditions with TKN.	with EAO	28-Oct-16
TKN-028	26-Jun-16	SEA on behalf of TKN	Water (Ground)	SEA (June 20, 2016) - Section 3.5.2 Baseline Water Quality at Kemess South Overview Current (baseline) water quality reporting for KS was limited to water supply wells despite there being a much large dataset for this area. In addition, the sulphate concentration in water supply well WQ-CW has increased from 34 mg/L to 96 mg/L. It is possible that this well was contaminated by sulphide oxidation processes, which could adversely affect or impact the quality of the water in this well and the suitability of this water for KUG operations. EA Information Requirement SEA recommends that AuRico complete the following: • Provide a summary of the groundwater quality downstream of the KS tailings storage facility (KS TSF). • Comment on the potential for water supply well WQ-CW to become contaminated during the KUG mine life and how that would affect KUG plans and operations.	The response is provided in memo **20160819_KUG Comments TKN 028, 029, 030, 032, 033, 036-043, 045_GW_Lorax_Memo.**	22-Aug-16
TKN-029	26-Jun-16	SEA on behalf of TKN	Water (Ground)	SEA (June 20, 2016) - Section 3.5.3 Broken Zone Overview The hydrogeologic parameters of the Broken Zone were not well defined in the EAC Application. Packer testing was unsuccessful in the Broken Zone due to high water take. This could indicate that preferential flow paths exist in this unit. The hydraulic conductivity estimates of the Broken Zone provided by Lorax are inconsistent – for example, the following statements (from the EAC Application, Appendix 9A) regarding hydraulic conductivity in the Broken Zone appear to be inconsistent: "Hydraulic conductivity measured in the Broken Zone in the cirque area ranges from approximately 2E-7 to 1E-8 m/s. A number of attempted packer tests in the Broken Zone were unsuccessful due to high water take indicating this zone contains intervals of higher permeability consistent with observations of its highly fractured nature observed in drill core." "The highest values are associated with fractured bedrock within the cirque area and Broken Zone. The K of fractured bedrock varies from approximately 1E-09 to 1E-05 m/s from a depth of 25 to 400 m below ground surface." "Fractured bedrock to a depth of approximately 250 m, including the Broken Zone, makes up the fractured bedrock system of the Project with an average hydraulic conductivity of 5E-08 m/s". EA Information Requirement SEA recommends that AuRico complete the following: • Indicate the number of wells intersecting this zone, as well as the associated hydraulic conductivity and number/range of unsuccessful packer tests. Explain what type of hydraulic conductivity would be associated with the unsuccessful packer estimates. • Summarize the water quality samples that were collected from Gossan in the Broken Zone.	The response is provided in memo **20160819_KUG Comments TKN 028, 029, 030, 032, 033, 036-043, 045_GW_Lorax_Memo.**	22-Aug-16
TKN-030	26-Jun-16	SEA on behalf of TKN	Water (Ground)	SEA (June 20, 2016) - Section 3.5.4 Hydraulic Conductivity across Contacts Overview The EAC Application indicates that hydraulic conductivity estimates across contacts were removed from the dataset when calculating geometric mean within a given rock unit (Appendix 9A, Section 4.1.1). EA Information Requirement SEA recommends that AuRico complete the following: • Comment on the possible preferential flow of water along the contacts (primarily between overburden and bedrock), and how this was incorporated into the conceptual understanding of flow at the site.	The response is provided in memo **20160819_KUG Comments TKN 028, 029, 030, 032, 033, 036-043, 045_GW_Lorax_Memo.**	22-Aug-16
TKN-031	26-Jun-16	SEA on behalf of TKN	Water (Ground)	SEA (June 20, 2016) - Section 3.5.5 Seep Water Quality Sampling Overview The EAC Application indicated that seeps were identified at the site (at 1,700 m, 1,600 m, and 1,400 m) (Section 4.1.2.7, Appendix 9C). EA Information Requirement SEA recommends that AuRico complete the following: • Provided conditions are safe, conduct a seep sampling program to evaluate the water quality of the seeps and to identify potential mineral precipitates in the vicinity of the seeps.	The Proponent may consider a seep sampling program at the Permitting stage if it is of value in verifying EA predictions.	22-Aug-16
TKN-031.1	7-Sep-16	SEA on behalf of TKN	Water (Ground)	Backeround: Seeps can be an excellent source of water quality information and can be used to refine geochemistry estimates. Infromation Requirement: Describe what information will be gained from the seep sampling survey (e.g., would the flow path of the seep intersect the Gossan?).	The reponse is provided in memo **20161110_KUG_Comments_TKN_Hydrogeo_Lorax Memo**	10-Nov-16

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TKN-032	26-Jun-16	SEA on behalf of TKN	Water (Ground)	SEA (June 20, 2016) - Section 3.6.1 Model Calibration Overview The EAC Application suggested that the calibrated groundwater model underestimated the head at higher elevations and overestimated the head at lower elevations (Figure 4.1-1, Appendix 9B). It further stated that the overestimated head (at lower elevations) will result in conservative dewatering predictions. However, the effect of the underestimated head (at higher elevations) was not discussed. EA Information Requirement SEA recommends that AuRico complete the following: • Describe how the underestimation of head (at higher elevations) might affect potential dewatering rates. Consider the scenario with residual heads between -40 m and -60 m. • Indicate how the positive bias at (lower elevations) and negative bias (at higher elevations) might affect cave zone filling and baseflow estimates during closure.	The response is provided in memo **20160819_KUG Comments TKN 028, 029, 030, 032, 033, 036-043, 045_GW_Lorax_Memo.**	22-Aug-16
TKN-032.1	7-Sep-16	SEA on behalf of TKN	Water (Ground)	Background: It appears that the calibration is slightly biased with elevation. This biased could impact flow patterns, filling rates, and dewatering rates. The impact of the biases on the results are explained but the model was not recalibrated to reduce the bias. Concern still exists that dewatering rates, flooding times, and flow patterns are associated with a degree of uncertainty not captured by the sensitivity analysis. EA Information Requirement: Describe how the bias to elevation could affect dewatering predictions.	The reponse is provided in memo **20161110_KUG_Comments_TKN_Hydrogeo_Lorax Memo**	10-Nov-16
TKN-033	26-Jun-16	SEA on behalf of TKN	Water (Ground)	SEA (June 20, 2016) - Section 3.6.2 Dewatering Requirements Overview The KUG mine will have an ongoing inflow of groundwater from the surrounding bedrock which will need to be pumped-out and managed during operations. The pumped-out mine water will be used for ore processing. Unused mine water will be stored in the KUG TSF, treated and released. The dewatering rates presented in the EAC Application may have been underestimated because the hydraulic conductivity (K value) is near the low end of the range of typical values. EA Information Requirement SEA recommends that AuRico complete the following: • Provide the results of a groundwater model scenario using the highest credible K value for the lateral intact bedrock, at least one order of magnitude higher than the current groundwater model input values. • Use the updated groundwater estimate in a revised water balance model to demonstrate that the proposed water management system will be able to keep up with that rate of dewatering without having to store excessive amounts of surplus water in the KUG TSF. In particular, indicate if the proposed water treatment will be able to keep up with the flow.	The response is provided in memo **20160819_KUG Comments TKN 028, 029, 030, 032, 033, 036-043, 045_GW_Lorax_Memo.**	22-Aug-16
TKN-033.1	7-Sep-16	SEA on behalf of TKN	Water (Ground)	Background: The author states that changing k in Broken Zone and of the surround units results in unrealistic recharge rates equivalent to 38% MAP. Given that the broken zone is in a topographic low and is broken (largeer infiltration with smaller evapotranspiration), it is not clear if this is an unrealistic number. The explanation that hydraulic conductivities can be changed by plus or minus an order of 2 is not sufficient because this small change in hydraulic conductivities substantially changes dewatering rates and flooding times. Concern still exists that dewatering rates, flooding times, and flow patterns are associated with a degree of uncertainty were not captured by the sensitivity analysis. EA Information Requirement: • Provide the results of a groundwater model scenario using the highest credible K value for the lateral intact bedrock, at least one order of magnitude higher than the current groundwater model input values. • Use the updated groundwater estimate in a revised water balance model to demonstrate that the proposed water management system will be able to keep up with that rate of dewatering without having to store excessive amounts of surplus water in the KUG TSF. In particular, indicate if the proposed water treatment will be able to keep up with the flow.	The response is provided in the memo **20161109_KUG Comment UG Dewatering Sensitivity_Memo** prepared in response to the action item from the Sub-working Group Meeting on September 8, 2016 and memo **20161110_KUG_Comments_TKN_Hydrogeo_Lorax Memo**	10-Nov-16
TKN-034	26-Jun-16	SEA on behalf of TKN	Water (Ground)	SEA (June 20, 2016) - Section 3.6.3 Diversion Efficiency Assumption Overview The EAC Application stated that diversions will be in place around the subsidence zone (Appendix 9B). It appears that the diversions were assumed to be 100% effective and that runoff from neighboring areas was assumed to not contribute to recharge. Given that dewatering rate estimates will affect other assumptions in the groundwater model such as treatment costs and storage volumes, some inefficiency in the surface water diversion should be assumed. EA Information Requirement SEA recommends that AuRico complete the following: • Account for some level of inefficiency (e.g., 10%) in the diversion system when calculating the dewatering flow, and account for it in a revised water balance / water quality model.	If diversion of runoff around the subsidence zone does not occur (i.e., 0% efficiency or 100% inefficiency), runoff from a 22 ha catchment area would contribute to recharge. If it is assumed that 100% of runoff from this 22 ha area contributes to the recharge, and directly adds to groundwater seepage into the underground mine, the average annual groundwater dewatering from the underground mine will be increased by 0.12 Mm^3. Currently, 120 L/s discharge from the KUG TSF to Attichika Creek is planned for the months of May to October during Operations. An increased volume of underground mine dewatering (i.e., 0.12 Mm^3/year) would require an additional 8 L/s discharge from the KUG TSF into Attichika Creek in the months of May to October during Operations, which is a 7% increase in discharge compared to the discharge presented in the Application. A 7% increase in discharge to the receiving environment is considered to be within the expected range of uncertainty in the modelling exercises used to inform the EA. AuRico is reviewing the planned diversion of this catchment around the subsidence zone, with a final decision to be described in subsequent permit applications, with an upper case scenario being an increased discharge from the KUG TSF of 7%. Water treatment capacity and receiving environment water quality predictions would correspondingly reflect the final proposed option for diversion of this catchment.	5-Aug-16
TKN-034.1	7-Sep-16	SEA on behalf of TKN	Water (Ground)	Background: Diversion inefficiency should be included in a base case scenario and not simply an upper case scenario. The upper case scenario should encompass other uncertainties such as porosity, hydraulic conductivity and recharge rate. Information Requirement: SEA recommends that the diversion efficiency of the diversion ditches be estimated. It could be that the slope limits the effectiveness of the ditches.	The response is provided in the memo **20161109_KUG Comment UG Dewatering Sensitivity_Memo** prepared in response to the action item from the Sub-working Group Meeting on September 8, 2016 and memo **20161110_KUG_Comments_TKN_Hydrogeo_Lorax Memo**	10-Nov-16
TKN-035	26-Jun-16	SEA on behalf of TKN	Water (Ground)	SEA (June 20, 2016) - Section 3.6.4 Post Closure Leakage from the Declines Overview Following operations, bulkheads (i.e., plugs) will be installed at the decline to facilitate flooding of the underground. Leakage from the bulkheads will be a likely source of mass loading into the receiving environment during post-closure. EA Information Requirement SEA recommends that AuRico complete the following: • Develop an estimate for bulk head leakage flow rate such that the leakage flow rate can be accounted for in water quality modelling for the post-closure phase.	Portal seepage rates have not been determined as flow arising from plug leakage is typically low and best estimates are obtained following subsequent and more detailed engineering design of the plugs. Based on literature review and expected head conditions behind the plug, an approximate estimate of leakage from the three portals is between 3 and 10 L/s. More detail is provided in memo response to comment MOE-070 (**20160706_KUG Comments_MOE-013,014,015,017,018,070_SW_WQ_Memo).**	5-Aug-16
TKN-035.1	7-Sep-16	SEA on behalf of TKN	Water (Ground)	The workging group plans to meet and discuss this issue on September 8, 2016.	Post-closure leakage through or around the decline closure plugs was discussed during the Septermber 8 Water Sub-Working Group meeting and resulted in an action item related to clarifying potential flow rates in the event of leakage or a failure of the plug; identify valued components that may be affected and put together a conceptual contingency plan for plug leakage/ failure. The The supplemental information presented in **20161109_A.1 KUG_Action Item#2_Sept 8 2016_Declines Closure Water Mgmt_Memo** address this action item.	10-Nov-16
TKN-036	26-Jun-16	SEA on behalf of TKN	Water (Ground)	SEA (June 20, 2016) - Section 3.6.5 Modelling Assumptions Overview The EAC Application stated that the upper bound estimate for recharge was calculated by reducing evapotranspiration by 25% (Section 7.3.1, Appendix 9B). Using this assumption for an upper case estimate, the upper case baseflow in East Cirque Creek would be 25 L/s; compared to the base case of about 23 L/s. This difference appears minimal. EA Information Requirement SEA recommends that AuRico complete the following: • Provide justification for calculating the upper bound estimate for recharge by reducing evapotranspiration by 25%.	The response is provided in memo **20160819_KUG Comments TKN 028, 029, 030, 032, 033, 036-043, 045_GW_Lorax_Memo.**	22-Aug-16

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TKN-036.1	7-Sep-16	SEA on behalf of TKN	Water (Ground)	Background: It is not clear the sensitivities capture a sufficient range of flows given the small changes to the parameters. It is uncertain if the change (lowering evapotranspiration by 25% to 200 mm may be within the range of probable scenarios during the life of mine). Information Requirement: • Provide the results of a groundwater model scenario using the highest credible rate of recharge. • Use the updated groundwater estimate in a revised water balance model to demonstrate that the proposed water management system will be able to keep up with that rate of dewatering without having to store excessive amounts of surplus water in the KUG TSF. In particular, indicate if the proposed water treatment will be able to keep up with the flow.	Determining the highest credible rate of recharge is a subjective exercise. As such, an alternate methodology was identified during the September 8 Water Sub-Working Group meeting to consider the sensitivity of Attichika Creek receiving environment predictions to high rate of underground dewatering. The results from this exercise are presented in the memorandum **20161109_KUG Action Item #3 Sept 8 2016_UG Dewatering Sensitivity_Memo**. The results presented in the memorandum indicate that receiving environment water quality predictions are relatively insensitive to increased mine dewatering rates such that 100% increase above base case estimates are not predicted to result in additional water quality effects beyond those assessed in the EAC Application. This conclusion is based on the ability of water treatment capacity to be increased from current planned capacity if underground dewatering rates are such that increased discharge from the KUG TSF is required. Due to the modular nature of the proposed treatment systems, this can be readily accommodated if necessary to remain in compliance with the associated effluent discharge permit. See also memo **20161110_KUG_Comments_TKN_Hydrogeo_Lorax Memo** for additional information.	10-Nov-16
TKN-037	26-Jun-16	SEA on behalf of TKN	Water (Ground)	SEA (June 20, 2016) - Section 3.6.6 Seasonal Variations in Baseflow EA Information Requirement SEA recommends that AuRico complete the following: • Describe how variation in baseflow was accounted for throughout the year as the water table varies by season.	The response is provided in memo **20160819_KUG Comments TKN 028, 029, 030, 032, 033, 036-043, 045_GW_Lorax_Memo.**	22-Aug-16
TKN-037.1	7-Sep-16	SEA on behalf of TKN	Water (Ground)	Background: It is not clear the sensitivity analysis captured a sufficient range of flows. Lorax mentioned (Aug 22 2016 working group meeting) there were only a few spot measurements during the winter; therefore, uncertainty in baseflow still exists. It is unclear how baseflow estimates for the summer were derived. Information Requirement: • Provide the results of a groundwater model scenario using the highest credible water table elevations surrounding the underground. • Use the updated groundwater estimate in a revised water balance model to demonstrate that the proposed water management system will be able to keep up with that rate of dewatering without having to store excessive amounts of surplus water in the KUG TSF. In particular, indicate if the proposed water treatment will be able to keep up with the flow.	The reponse is provided in memo **20161110_KUG_Comments_TKN_Hydrogeo_Lorax Memo**	10-Nov-16
TKN-038	26-Jun-16	SEA on behalf of TKN	Water (Ground)	SEA (June 20, 2016) - Section 3.6.7 Orographic Effects Overview The Hydrogeology Baseline Report in the EAC Application (Appendix 9A) indicated that precipitation depths increase with elevation. EA Information Requirement SEA recommends that AuRico complete the following: • Describe how orographic effects were considered in the groundwater models.	The response is provided in memo **20160819_KUG Comments TKN 028, 029, 030, 032, 033, 036-043, 045_GW_Lorax_Memo.**	22-Aug-16
TKN-038.1	7-Sep-16	SEA on behalf of TKN	Water (Ground)	Background: During the Aug 23, 2016 working group meeting, MEM requested additional information for how the orographic relationship was developed. Information Requirement: SEA would like to review AuRico's response to the MEM informaiton requirment when it comes available.	The reponse is provided in memo **20161110_KUG_Comments_TKN_Hydrogeo_Lorax Memo**	10-Nov-16
TKN-039	26-Jun-16	SEA on behalf of TKN	Water (Ground)	SEA (June 20, 2016) - Section 3.6.8 Effect of Simplifying Assumption on Model Output Overview Overburden was not included in the groundwater model because the bedrock has a lower hydraulic conductivity than the overburden. EA Information Requirement SEA recommends that AuRico complete the following: • Describe how/if removing overburden and potential preferential flow pathways from the groundwater model could affect base-flow and particle tracking results.	The response is provided in memo **20160819_KUG Comments TKN 028, 029, 030, 032, 033, 036-043, 045_GW_Lorax_Memo.**	22-Aug-16
TKN-040	26-Jun-16	SEA on behalf of TKN	Water (Ground)	SEA (June 20, 2016) - Section 3.6.9 Packer Test Results for the Broken Zone Overview It would appear that based on the fractured nature of the rock, packer tests did not take into account the Broken Zone. EA Information Requirement SEA recommends that AuRico complete the following: • Describe if this occurrence was consistent with the calibrated hydraulic conductivity estimate of 1.3E-7 m/s in the Broken Zone.	The response is provided in memo **20160819_KUG Comments TKN 028, 029, 030, 032, 033, 036-043, 045_GW_Lorax_Memo.**	22-Aug-16
TKN-041	26-Jun-16	SEA on behalf of TKN	Water (Ground)	SEA (June 20, 2016) - Section 3.6.10 Assumed Porosity of the Cave Zone Overview Porosity of the cave zone will affect the amount of time that sulphide material is exposed. This could lead to an increased amount of ARD, which could affect receiving environment water quality predictions for some parameters. Maximum porosities for the Cave Zone were reported in the EAC Application (Appendix 9B) to be lower than typical values. EA Information Requirement SEA recommends that AuRico complete the following: • Provide justification for the porosities for the Cave Zone to be lower than typical values.	The response is provided in memo **20160819_KUG Comments TKN 028, 029, 030, 032, 033, 036-043, 045_GW_Lorax_Memo.**	22-Aug-16
TKN-041.1	7-Sep-16	SEA on behalf of TKN	Water (Ground)	Background: SEA is not satisfied that the sensitivity analysis captures the uncertainties in flows and flooding times. Lorax's answer for the porosity is plausible but is not without uncertainty. Information Requirement: Carry out a sensitivity analysis to evaluate the possible range of flooding times for the largest credible range in porosity.	The reponse is provided in memo **20161110_KUG_Comments_TKN_Hydrogeo_Lorax Memo**	10-Nov-16
TKN-042	26-Jun-16	SEA on behalf of TKN	Water (Ground)	SEA (June 20, 2016) - Section 3.6.11 Assumed Hydraulic Conductivity in the Cave Zone Overview The cave zone was modelled with a hydraulic conductivity of 5E-4 m/s. Justification for this estimate was based on the fact that flow reaching the underground was not sensitive to hydraulic conductivity estimates above 5E-5 m/s. Subsequent sensitivities involved doubling or halving hydraulic conductivities. EA Information Requirement SEA recommends that AuRico complete the following: • Given the uncertainty of the permeability of the cave zone, explain how/if varying the hydraulic conductivity of the cave zone will affect results for closure and post-closure in the receiving environment.	The response is provided in memo **20160819_KUG Comments TKN 028, 029, 030, 032, 033, 036-043, 045_GW_Lorax_Memo.**	22-Aug-16

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TKN-043	26-Jun-16	SEA on behalf of TKN	Water (Ground)	SEA (June 20, 2016) - Section 3.6.12 Hydraulic Conductivity by Formation Overview Hydraulic conductivities in the groundwater model varied with depth but not with formation (with the exception of unit 1 which is only 20 m thick). However, the hydraulic conductivities in the baseline report were categorized by unit. For example, the geomean of the Takla group was 9E-9 m/s (3E-11 m/s and 6 E-6 m/s) and the geomean for the Hazelton Group was 3E-7 m/s (1E-8 m/s and 8E-6 m/s). Furthermore, the calibrated hydraulic conductivities in layer one in the model are significantly different for the Takla and Hazelton groups, being 7E-8 m/s and 1.3-7 m/s, respectively. In layer two of the model, the hydraulic conductivity was assumed to be 7E-8 m/s. However, Figure 3.3-1 of the EAC Application showed a larger number of measured hydraulic conductivities that exceed this estimate at depths below 20 m. It is unclear why this level of detail was dropped beyond a depth of 20 m. EA Information Requirement SEA recommends that AuRico complete the following: • Provide justification for the simplifying assumptions for bedrock hydraulic conductivity at depths below 20 m. Describe how the model results could be affected by this approach, compared with the approach of using K values by rock unit. • The hydraulic conductivity of the Broken Zone should extent to 75 metres below ground surface (mbgs), and in some locations to 150 mbgs.	The response is provided in memo **20160819_KUG Comments TKN 028, 029, 030, 032, 033, 036-043, 045_GW_Lorax_Memo.**	22-Aug-16
TKN-043.1	7-Sep-16	SEA on behalf of TKN	Water (Ground)	Background: The response by AuRico indicated that the Broken zone extends down 100 m. However, it was not clear if this value was different from the original application, or if this value was changed as a result of the technical review. If it was changed, the impacted to flow patterns and rates were not described. Information Requirement: If the assumed depth of the broken zone was changed, describe the impacted to flow patterns and rates that resulted from that modification.	The reponse is provided in memo **20161110_KUG_Comments_TKN_Hydrogeo_Lorax Memo**	10-Nov-16
TKN-044	26-Jun-16	SEA on behalf of TKN	Water (Ground)	SEA (June 20, 2016) - Section 3.7.1 Dam Seepage Overview The estimated rate of post-closure KUG TSF dam seepage is relatively low (0.4 L/s). In SEA's experience, higher total seepage rates are observed for most tailings dams of this size. The rate of 0.4 L/s appears to be reflective of the unrecoverable seepage rather than the total expected seepage through the tailings dam. EA Information Requirement SEA recommends that AuRico complete the following: • Compare the estimated seepage rates with the seepage measured from other similar tailings dams to justify the seepage rates that were used and reported in the EAC Application. • Assess the effects to water quantity and quality in the receiving environment if the seepage rates are higher. Use seepage rates from existing analogous tailings dams and / or from calculated seepage rates using upper bound input assumptions (e.g., upper bound K value). Consider the scenarios where the hydraulic conductivity is 1 and 2 orders of magnitude higher than was assumed in the EAC Application (Appendix 9C).	The seepage rate given in design (22 L/min) is the total expected seepage rate, not the unrecoverable seepage rate. The seepage rate is low for a tailings impoundment of this size owing to the competent bedrock foundation and wide above-water beach. Appendix C of the 2012 Waste Management Report outlines the seepage analyses carried out as part of the feasibility level design. As part of those analyses, sensitivity analyses were carried out for variations of up to two orders of magnitude for the bedrock, till core, tailings beach, and combinations thereof. As well, the effect of variation in the tailings beach width was assessed. Only for the unrealistic scenario of the hydraulic conductivity of both the tailings and bedrock significantly higher than assumed, was a significant increase in seepage indicated in modeling results.	5-Aug-16
TKN-044.1	7-Sep-16	SEA on behalf of TKN	Water (Ground)	Background: Some uncertainty exists with the modelled seepage rates and the impact on water quality predictions remains unknown. Information Requirement: Carry out a sensitivity analysis to develop a more conservative range of seepage rates (e.g., vary the k value by 10 rather than by 2) from the TSF and evaluate their impact on the receiving environment water quality.	Appendix C of the AMEC Mine Waste and Water Management Design Report (AMEC, 2012) estimated the base case seepage rate from the KUG TSF Dam to be 0.4 L/s. Sensitivity analysis results showed that the seepage would be increased to 1 L/s if presumed hydraulic conductivity of the upper and middle bedrock were increased by a factor of 10 (Table 4.1 in Appendix C of the AMEC Mine Waste and Water Management Design Report). Base case water quality modelling for the EAC Application assumed this upper estimate (i.e., 1 L/s) for seepage from the KUG TSF Dam. . Further, water quality model sensitivity case 4 (see Section 3.4 of Appendix 11-D), accessed upper groundwater case estimates (2 L/s from the south wall and 1.2 L/s through the TSF Dam; Table 2.2-6 of Appendix 11-D). Reference: AMEC (2012) Kemess Underground Project (KUG) Feasibility Study - Mine Waste and Water Management Design Report. Prepared for AuRico Metals Inc. Prepared by: AMEC Environment & Infrastructure, a Division of AMEC Americas Limited, Burnaby, BC	28-Oct-16
TKN-045	26-Jun-16	SEA on behalf of TKN	Water (Ground)	SEA (June 20, 2016) - Section 3.7.2 Wall Seepage Overview SEA identified various concerns regarding wall seepage. For example, during sensitivity analyses for the seepage through the south wall, the hydraulic conductivities were changed by a factor of 2. In addition, seepage to Kemess Creek through the south wall was based on a 5% recharge rate (annual precipitation was assumed to be 746 mm/year). SEA also notes that tailings should be modelled as anisotropic in the pit wall seepage calculations. EA Information Requirement SEA recommends that AuRico complete the following: • To be conservative, increase the K value for the sensitivity analyses of the seepage through the south wall by at least a factor of ten. • Consider the possibility of the presence of preferential flow pathways and how this would affect seepage estimates. • Demonstrate the sensitivity of the results for a range of typical recharge rates, and for the expected range of expected annual precipitation at the site. Indicate how the uncertainty in wall seepage could affect post-closure water balance and water quality modelling. • Calculate pit wall seepage assuming the tailings are anisotropic.	The response is provided in memo **20160819_KUG Comments TKN 028, 029, 030, 032, 033, 036-043, 045_GW_Lorax_Memo.**	22-Aug-16
TKN-045.1	7-Sep-16	SEA on behalf of TKN	Water (Ground)	Background: Some uncertainty exists with the modelled seepage rates and the impact on water quality predictions remains unknown. Information Requirement: Carry out additional sensitivity analyses to develop a more conservative range of seepage rates (e.g., vary the k value by 10 rather than by 2) from the TSF and evaluate their impact on the receiving environment water quality.	The reponse is provided in memo **20161110_KUG_Comments_TKN_Hydrogeo_Lorax Memo**	10-Nov-16
TKN-046	26-Jun-16	SEA on behalf of TKN	Water (Ground)	SEA (June 20, 2016) - Section 3.8 Baseline Hydrology Report Overview Characterisation of local streamflow and meteorology were well documented in the EAC Application (Appendix 10A). However, flow data from the existing reclaimed KS mine drainage system were not included. Because the KS mine will be within the drainage system of the KUG mine, the existing KS mine drainage system is part of the KUG baseline (i.e., current conditions). The following KS mine components will continue to contribute flow into the KUG drainage system and their loading contributions need to be accounted for in the KUG predictive water balance and water quality model: • KS TSF Dam embankment seepage; • KS TSF Dam embankment runoff; • KS TSF Dam foundation seepage; • KS TSF Dam spillway discharge; • KS Pit Highwall Runoff; and • KS Waste Rock Dump drainage. It is expected that the hydrologic data that have been collected from these sources were used to calibrate the KUG water balance. For example, concurrent precipitation, temperature, and flow rates measured in the immediate years following closure could have been used to calibrate the runoff coefficient (i.e., drainage from waste rock with respect to precipitation), and timing of drainage from the non-acid generating waste rock dump (NAG WRD). Another relevant calibration example would be the accumulation of water in the KS TSF. SEA understands that the TSF Pond has not yet filled and began to discharge into South Kemess Creek. The incremental accumulated volume in the KS TSF should be combined with recent precipitation, temperature, seepage, records to verify that the water balance assumptions (e.g., runoff coefficients, pond evaporation, etc.) are able to reproduce the recent filling conditions the KS TSF. In that case the calibrated hydrologic values (e.g. pond evaporation, runoff coefficient for the TSF watershed, etc) can be applied in the long-term projections in the KUG water balance model. Historical KS TSF seepage can provide an indication for the seepage relationship with respect to water surface elevation (i.e., available head) in the KS TSF. This relationship could be used to evaluate hydraulic conductivity of the KS TSF Dam and to predict what the seepage rate will be when the KS TSF has reached its ultimate water surface elevation. EA Information Requirement	The requested information is provided in memo **20160603_KUG Comment TKN-000_Hydrology_Memo** originally provided on June 3, 2016.	12-Sep-16

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TKN-047	26-Jun-16	SEA on behalf of TKN	Water (Surface)	SEA (June 20, 2016) - Section 3.9.1 Valued Components that Depend on Changes in Hydrology Overview The approach to evaluate changes in hydrology was well presented in the EAC Application. However, treating hydrology itself as a Valued Component (VC) is an incomplete assessment. Changes in hydrology will affect other VCs such as terrain stability, fish, wetland ecosystems, aquatic habitat, current use of lands and resources for traditional purposes. Accordingly, the changes to hydrology should be incorporated into the effects assessments of such other VCs. EA Information Requirement SEA recommends that AuRico complete the following: • Provide a list of the VCs for the KUG that depend on hydrology as input to their evaluation. Indicate where to find those studies in the EAC Application. • Provide short descriptions for how hydrology was accounted for in the effects assessments of the above-mentioned hydrology dependant VCs. Paraphrase the results of the effects assessments for hydrology dependent VCs (i.e., how did changes to hydrology affect the outcome of those VCs).	The effects assessment for surface water quantity VCs was completed only based on predicted changes in stream flow rates. The relevance of these changes to other VCs is addressed in the effects assessments for those VCs. VCs that incorporated a consideration hydrology as pathway to effect included: water quality, terrain stability, fish and fish habitat, wetland ecosystems and current use of lands and resources for traditional purposes (CULRTP). Water Quality (WQ) VC. Project related impacts to stream flows were fully incorporated in the surface water quality model used to support the effects assessment on surface water quality. The development of and results of the water balance and water quality models are provided in Appendix 11-D of the Application. An assessment of residual effects to water quality is provided in Chapter 11 of the Application. Terrain Stability VC: Surface hydrology was considered in the assessment of Project effects on terrain stability. Descriptions of current terrain stability conditions, including associated effects from streams is detailed in Section 12.4.3.5. Project effects considered activities that could affect slope hydrology in relation to terrain stability. Residual Project effects on terrain stability related to hydrology included project components such as quarry walls and East Dam (Section 12.6.2.1). However, the greatest effects on terrain stability and mitigation measures to reduce these effects were related to instability associated with construction occurring in erodible soils and steep, unstable terrain not interactions between hydrology and terrain stability (Table 12.6-6). Wetland Ecosystems VC: Project effects on wetlands related to changes in hydrology were assessed in Section 13.5.3.3. No direct changes to wetlands were predicted due to effects on hydrology in the access corridor or decline portal area. Effects related to changes in hydrological patterns due to the Attichika Creek Discharge Waterline could alter wetland hydrologic functions adjacent to the pipeline by altering soil moisture in the vicinity of the pipeline or through changes to hydrology from compaction of soil and runoff patterns at the site level. Fish and Fish Habitat VCs. Changes to surface hydrology were accounted for the Fish and Aquatic Habitat VCs. Surface water quantity changes can impact fish and aquatic habitat through changes to channel morphology and stream flows resulting in alteration of aquatic habitat (see Section 14.5.2.3 for detail). The baseline hydrology report (Appendix 10-A) and the water-balance modelling results informed the residual effects assessment for the Fish and Aquatic Habitat VCs. Summary of residual effects on Fish and Aquatic Habitat VCs from changes in hydrology is provided in Section 14.6.1.1 of the Application. Residual effects were identified due to increased stream flow in lower Attichika Creek during Construction and increased in Waste Rock Creek during Closure and Post-Closure. All residual effects are deemed to be not-significant. CULRTP. Changes to hydrology are considered indirectly in the assessment of potential effects on CULRTP. This includes consideration of potential effects to harvesting activities—including fish, wildlife, and plants, which could in turn be affected by changes to hydrology (as discussed in Section 20.6.1.3). In addition, potential effects on to cultural heritage (including sacred sites and habitations/trails) which could be directly affected by changes in surface water hydrology. Considering the outcomes of the assessment of other VCs (including fish and aquatic habitat, terrestrial ecology, wildlife, country foods, and heritage resources; many of which are supported by the hydrology assessment), no potential effects related to changes in hydrology were identified.	5-Aug-16
TKN-048	26-Jun-16	SEA on behalf of TKN	Water (Surface)	SEA (June 20, 2016) - Section 3.9.2 Show Drainage Areas in Figure 10.3-2 Overview Additional information on Figure 10.3-2 (Water Balance Nodes) of the EAC Application would clarify how the modelling nodes are interconnected relative to each other and to the proposed mine components. EA Information Requirement SEA recommends that AuRico complete the following: • Include the drainage basin boundaries of the modelling nodes on Figure 10.3-2. • Include a simple depiction of the main components of the KS mine and the KUG (e.g., KS TSF, KUG TSF, NAG Dump, KUG mine site).	The response is provided in memo **20160805_A.1_KUG Comments TKN-048, 049, 050, 118_.WQ_Memo**.	22-Aug-16
TKN-049	26-Jun-16	SEA on behalf of TKN	Water (Surface)	SEA (June 20, 2016) - Section 3.9.3 Paraphrase Sensitivity Analysis Results Overview The EAC Application provided some description of the sensitivity analysis methodology (Section 10.6.1.1). However, the results of the analysis were not provided therein. Instead, the EAC Application stated that "Sensitivity analysis results are presented in Appendix 10C of this assessment (see Appendices 10C.12 and 10C.13)". EA Information Requirement SEA recommends that AuRico complete the following: • Paraphrase the results of the sensitivity analysis presented in Appendix 10C of the EAC Application in a few sentences in Section 6.6.1 of the EAC Application so appendices need not be referenced for an overview of the sensitivity analysis results.	The response is provided in memo **20160805_A.1_KUG Comments TKN-048, 049, 050, 118_.WQ_Memo**.	22-Aug-16
TKN-050	26-Jun-16	SEA on behalf of TKN	Water (Surface)	SEA (June 20, 2016) - Section 3.9.4 Follow-Up Programs Overview The EAC Application described the hydrology monitoring program that will be in place to measure KUG-related effects and to verify the water balance predictions (Section 10.7.2.3). Specific information about the monitoring stations would clarify the proposed program. EA Information Requirement SEA recommends that AuRico complete the following: • Provide a list (and map) of the proposed hydrology monitoring stations and their purpose. • Identify potential new hydrology stations that AuRico plans to add to the monitoring network. • Identify existing stations that are no longer required, along with decommissioning plans.	The response is provided in memo **20160805_A.1_KUG Comments TKN-048, 049, 050, 118_.WQ_Memo**.	22-Aug-16
TKN-051	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.10.1 Proposed Additional Sampling Programs Overview Modifications to the sampling program should be completed in order to evaluate changes to receiving environment water quality from the current conditions and throughout the duration of the mine life. Proposed EAC Conditions If approved, SEA recommends the following as an EAC Condition: • Additional monitoring stations and frequencies should be required as follows: a) Monitor WQ-14F at a similar frequency as the waste rock seepage ponds (monthly); b) Monitor Amazay Lake at a specified monitoring location at least quarterly (SEA notes that although there is an active water quality monitoring station along Amazay Creek downstream from the lake outlet (KN-08) which can be considered representative of Amazay Lake discharge water quality, it does not appear that current water quality has been monitored in Amazay Lake); and c) Re-establish inactive monitoring stations DLI1A, LDI2, DLI4, and DLI5 and sample these at least quarterly. (SEA notes that the tributaries to Amazay Lake are potential groundwater flow paths from the proposed subsidence zone following mine reclamation. At present, only Central Cirque Creek (KN-09) is being monitored). • Commence monitoring before mining activities begin, and carry out monitoring for a sufficient length of time to accurately understand current conditions.	Water quality monitoring is described in the Fish and Aquatic Effects Monitoring Plan (Section 24.7), which will be developed in full during the Project permitting process to meet the requirements set out by provincial permits and federal regulations. a) As indicated in Table 3.2 of Appendix 11A, WQ-14F is monitored monthly as part of the Kemess South monitoring program and will be continued as part of the KUG monitoring program. b) and c) A monitoring location in Amazay Lake as well as the inlets to the lake will be considered in the development of the water quality monitoring program for the KUG Project.	5-Aug-16
TKN-051.1	7-Sep-16	SEA on behalf of TKN	Water (Quality & Treatment)	Background: TKN would like to see water quality monitoring stations established Amazay Lake and its tributaries such that existing condtions can be established, and compared to observed conditions throughout the mine life. If approved, SEA recommends the following as an EAC Condition: Commence monitoring before mining activities begin, and carry out monitoring for a sufficient length of time to accurately understand current conditions. Additional monitoring stations and frequencies should be required as follows: a) Monitor Amazay Lake at a specified monitoring location at least quarterly (SEA notes that although there is an active water quality monitoring station along Amazay Creek downstream from the lake outlet (KN-08) which can be considered representative of Amazay Lake discharge water quality, it does not appear that water quality has been monitored in Amazay Lake); and b) Re-establish inactive monitoring stations DLI1A, LDI2, DLI4, and DLI5 and sample these at least quarterly. (SEA notes that the tributaries to Amazay Lake are potential groundwater flow paths from the proposed subsidence zone following mine reclamation. At present, only Central Cirque Creek (KN-09) is being monitored).	Monitoring locations and frequency of monitoring will be finalized during the Project permitting phase. AuRico acknowledges further discussion on the comment is deferred to permitting when the Fish and Aquatic Effects Monitoring Plan will be developed in full.	28-Oct-16

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TKN-052	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.10.2 Station Location Figures Overview The surface water quality station location figures (EAC Application, Figures 3-1 to 3-3) include dashed lines to delineate some site features, but were difficult to read and assess because most lines depicted on those figures were dashed. EA Information Requirement SEA recommends that AuRico complete the following: • Ensure that KS infrastructure is easily identifiable (including the TSF, TSF dam, TSF spillway, TSF SCP, dump, dump SCP, open pit), with water bodies and flow paths also presented for those components, on the EAC Application Figures 3-1 to 3-3.	The response is provided in memo **20160805_KUG Comment TKN-052_WQ_memo**.	5-Aug-16
TKN-053	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.10.3 Flow Paths along Water Quality Monitoring Network Overview Flow paths along the water quality sampling network were not clearly identified in the EAC Application. It is important that reviewers are able to understand the source of existing contaminants of concern (CoCs) (i.e., are they mine derived or naturally occurring), and their receptors. EA Information Requirement SEA recommends that AuRico complete the following: • Clearly depict the watercourses associated with each water quality sample location on Figures 3-1 to 3-3 of the EAC Application.	The watercourse associated with each water quality sample location is provided in Table 3.2 of Appendix 11-A.	5-Aug-16
TKN-054	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.10.4 Historic Activities and Water Quality Overview To assist in the trend analysis, including understanding whether or not concentrations of key CoCs (such as sulphate and selenium) are increasing or decreasing with time, there must be a clear understanding of the historical activities at KS. EA Information Requirement SEA recommends that AuRico complete the following: • Provide additional discussion of historic mining activities and timelines at KS, and how observed concentrations relate to those dates (i.e., how and where did water quality vary downstream from the mine from pre-KS to present). • Present trends related to KS operations presented as figures in the EAC Application.	Historical mining and mineral exploration activities associated with the former Kemess South (KS) mine have influenced surface water quality of some model nodes used for the Kemess Underground (KUG) environmental assessment. Section 11.4.3 and Figures 11.4-1, 11.4-2, and 11.4-3 of the Application presents water quality of Kemess Creek, Waste Rock Creek, and Attichika Creek watersheds over three time periods, representing data collected prior to the start of construction activities, data collected during KS mine operations, and data collected since the mine entered a post closure phase. Additional time-series plots over these phases are also been presented in memo **20160805_KUG Comment TKN-055, 056_WQ_Memo**. Sources of all metal loadings related to KS facilities, including selenium, are discussed in Sections 3.2.1.2 and 3.3 of Appendix 11-D of the Application.	5-Aug-16
TKN-055	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.10.5 Water Quality Guidelines and Identification of CoCs Overview To understand the CoCs and associated risks with respect to the KUG, it is critical that data be clearly presented in the EAC Application. EA Information Requirement SEA recommends that AuRico complete the following: • Update Appendix II (Sampling Results and Summary Statistics) of the EAC Application to include water quality guideline exceedances that clearly indicate trends and CoCs. • Include a table in the EAC Application showing all parameters that have exceeded standards and guidelines. The table should indicate which standards and guidelines were exceeded and if this occurred consistently, frequently, seasonally (winter, or freshet), and over which phase of KS mining operations. Potential sources of exceedances should also be identified. • Provide summaries of the CoCs associated with existing sources (TSF, pits, dumps, natural geology).	The response is provided in the memo **20160805_KUG Comment TKN-055-056_WQ_Memo.**	5-Aug-16
TKN-056	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.10.6 Proposed Additional Sampling Programs EA Information Requirement SEA recommends that AuRico complete the following: • Provide plots in Section 4.3.1.2 of the EAC Application showing sulphate concentrations for the Kemess Creek and Attichika Creek watersheds, particularly downstream from the waste rock, in the pit lake, and downstream from the KS TSF.	The response is provided in the memo **20160805_KUG Comment TKN-055-056_WQ_Memo.**	5-Aug-16
TKN-057	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.10.7 Nitrogen Species Overview Where nitrogen species are related to blasting activities, they should be included in the assessment presented in the EAC Application (in Sections 4.4.1.1 and 4.4.1.2) because blasting residue is often quickly depleted and the historic levels of nitrite and nitrate may not be an indication of expected long-term conditions. EA Information Requirement SEA recommends that AuRico complete the following: • Revise Sections 4.4.1.1 and 4.4.1.2 of the EAC Application to include nitrogen species related to blasting activities.	The water quality effects assessment for the Kemess Underground Project (KUG) is described in Chapter 11 and Appendix 11-D of the Application and it includes consideration of the existing KS site and facilities. AuRico plans to use emulsion-based explosives which do not release nitrates that are associated with ANFO explosives use. Sections 3.2.1.2 and 3.3 of Appendix 11-D discuss sources of potential geochemical loadings related to the KS facilities, including nitrogen species, which have been incorporated into the predictive modelling to support the Application. To support the Application, results of water quality monitoring and baseline studies for stations within and downstream of the former KS mine footprint were incorporated as source terms for the predictive water quality modelling. These data focused on water quality data collected since the KS mine entered the Post-closure phase (April 2011 to December 2014) and represent the existing water quality conditions for the purposes of the KUG effects assessment. This method provides an accurate representation of background conditions, and is inclusive of the potential effects of the KS mine. Additional time-series plots of long-term trends of nitrate and nitrate concentrations are presented in the memo **20160805_KUG Comment TKN-055, 056_WQ_Memo.**	5-Aug-16
TKN-058	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.10.8 Aluminum Exceedances Downstream from the NAG WRD Overview The Attichika Creek aluminium discussion (EAC Application, Section 4.5.1.1) stated that exceedances were observed downstream from the WRD during freshet. It is unclear from the discussion whether the aluminum exceedances have been recently observed (i.e., since KS mine closure) and what was the likely source of the aluminum. EA Information Requirement SEA recommends that AuRico complete the following: • Describe the potential and likely sources of the aluminum observed downstream from the WRD during freshet.	Figure 11.4-2 and Figure 11.4-3 as well as Table 11.4-1 and Table 11.4-5 of the Application present dissolved aluminum concentrations relative to applicable BC water quality guidelines for Waste Rock Creek and Attichika Creek (i.e., downstream of the WRD). Water quality monitoring data is presented for three time periods: data collected prior to the start of KS construction activities, data collected during KS mine operations, and data collected since the mine entered a post closure phase (see Section 11.4.3, Existing Water quality Conditions). Supplementary information requested in comment #TKN-055 regarding existing surface water quality conditions are also presented in memo 20160805_KUG Comment TKN-55,56_WQ_Memo. No exceedances of dissolved aluminum guideline have been observed on Waste Rock Creek since KS mine closure. Monitoring data collected since KS mine closure indicate that during freshet (May to July), monthly maximum and 95th percentile dissolved aluminum concentrations on Attichika Creek downstream of Waste Rock Creek are greater than applicable BC water quality guidelines. These results are similar to the dissolved aluminum concentrations at upstream reference sites on Attichika Creek (WQ-13) and Kemess Creek (WQ-04), as well as pre-KS conditions at WQ-17. This indicates that dissolved aluminum concentrations likely reflect a natural upstream source/ general mineralization of the catchment rather than the WRD.	5-Aug-16

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TKN-059	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.10.9 Selenium Plots Overview Time-series plots showing selenium concentrations could provide important information on the potential and duration of selenium effects. EA Information Requirement SEA recommends that AuRico complete the following: • Construct selenium plots for KS in the waste rock creek and Attichika Creek. • Identify potential sources of selenium.	Selenium concentrations within Waste Rock Creek and Attichika Creek over the various phases of the Kemess South mine are provided in Figures 11.4-1, 11.4-2, and 11.4-3 of the Application. Time-series plots of selenium over these phases have also been presented in memo response to comment **20160805_KUG Comment TKN-055, 056_WQ_Memo**. Sources of all metal loadings related to KS facilities, including selenium, are discussed in Sections 3.2.1.2 and 3.3 of Appendix 11-D of the Application.	5-Aug-16
TKN-060	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.10.10 Proposed Additional Sampling Programs EA Information Requirement SEA recommends that AuRico complete the following: • Include data that would permit characterization of any downstream effects on the Finlay River resulting from other mining activities (i.e., Shasta and Baker or placer mining).	Baseline water quality within the Finlay River is discussed in Section 11.4.3.3 of the Application. Water quality predictions in the Finlay River are discussed in Section 3.5.2 and Appendix 3 of Appendix 11-D. No Kemess Underground project related COPCs are predicted in the Finlay River, thus specific characterization of potential influence of the Shasta or Baker mines is outside the scope of the KUG EA.	5-Aug-16
TKN-061	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.10.11 Proposed Additional Sampling Programs EA Information Requirement SEA recommends that AuRico complete the following: • Identify any historical exceedences for lead in the Kemess Creek watershed (EAC Application, Section 4.5.1.9).	Section 11.4.3 and Figures 11.4-1, 11.4-2, and 11.4-3 of the Application presents water quality of Kemess Creek over three time periods, representing data collected prior to the start of construction activities, data collected during KS mine operations, and data collected since the mine entered a post closure phase. Additional time-series plots over these phases are also been presented in memo **20160805_KUG Comment TKN-055, 056_WQ_Memo**. Historical water quality concentrations in Kemess Creek Watersheds (WQ-01, WQ-04, and WQ-05) show no exceedance of the BC lead hardness-dependent guideline for the protection of freshwater aquatic life.	5-Aug-16
TKN-062	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.11 Surface Water Quality Effects Assessment Overview The surface water quality effects assessment presented in the EAC Application (Section 11) provided a clear description of the assessment methodology. A sufficient level of detail was summarized from the water quality model results to convey what information went into the assessment. The assessment appeared to have been carried out objectively using quantitative and semi-quantitative methodologies where possible. SEA understands that post-closure flows of contact water from the mineralized zone and into East Cirque Creek are expected to increase by 28-40% (compared to current conditions) which would increase the volume (and loading) of contact water from the mineralized zone. EA Information Requirement SEA recommends that AuRico complete the following: • Describe why the additional post-closure volume of contact water with the mineralized zone resulted in lower concentrations at water quality sampling station KN-12 compared to the construction phase (which roughly represents current conditions).	It is expected that Post-Closure base flow in East Cirque Creek will increase above background conditions by an upper bound of 28% over the entirety of the post closure period, once the water table in the area of the cave zone reaches equilibrium. However, geochemical predictions indicate that loadings from the flooded cave zone will approximate background conditions from the present mineralized zone. Thus, concentrations within East Cirque Creek and Attycelley post-closure are expected to remain similar to baseline conditions, this is consistent with the model predictions.	5-Aug-16
TKN-062.1	7-Sep-16	SEA on behalf of TKN	Water (Quality & Treatment)	Background: The (pre-mining) loading that no longer flows into Central Cirque should be added to East Cirque Creek in the Post-Closure water quality model. Information Requirement: Account for the loading that will be diverted from Central Cirque and will flow into East Cirque Creek in the water qulaity modelling as a result of the post-closure cave zone.	Predicted water quality results for East and Central Cirque Creeks are inclusive of predicted changes in non-contact and contact water loadings (i.e., predicted base flow reduction and additions in East Cirque Creek) and are summarized in Table 3.5-8 and Table 3.5-9 of Appendix 11-D, respectively. That is, water quality predictions are reflective of hydrogeological modeling results, which are input to the surface water balance and water quality model. Sources of loadings reporting to East Cirque Creek over LOM, as well as predicted changes in loading rate (mg/s) from both contact and non-contact water are presented in memo **20160805_KUG Comment MEM-067_WQG_Memo.**	28-Oct-16
TKN-063	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.12.1 Calibration Using Historic Data from the Reclaimed KS Mine Overview Hydrology data collected since closure of the KS mine is a valuable resource for calibrating various hydrologic characteristics of the existing site. Calibrated hydrologic parameters (such as runoff coefficients) can be applied in the predictive modelling for the KUG. EA Information Requirement SEA recommends that AuRico complete the following: • Describe how historical datasets of KS mine site hydrology (pond water levels/elevations, seepage pond flows, etc) were used to calibrate the water balance models for the KS mine components. For example, was concurrent meteorological data combined with flow data to determine the runoff coefficient and timing of runoff from the NAG waste rock dump?	Three categories of historical hydrology data exist at, and downstream of, the Kemess South (KS) infrastructure. 1. Historical lake level and seepage from the KS TSF were used for groundwater modelling (AMEC 2007) to estimate seepage from the KS TSF. These historical records were used to estimate the constant seepage rate of 3.6 Mm^3/year as an input to the water balance model (Section 1.3.9 in Appendix 11-D). 2. Historical flows in the NAG Waste Rock Dump area: available flow records at the Western Pond Collection System and Southern Pond Collection System were used to qualitatively calibrate the water balance model at the NAG Waste Rock Dump area. These historical flows are not long-term continuous record, and therefore could not be used for quantitative calibration. 3. Historical streamflow in Kemess Creek downstream of the KS TSF (hydrometric stations WQ05, WQ03, and WQ01) were recorded during the post-closure phase of the KS project when the KS TSF was being filled, and the hydrologic response was non-stationary (i.e., hydrologic response was affected by the transient variables and parameters including: lake evaporation, TSF seepage, and diverted/undiverted runoff). Water balance modelling during this period would require a non-stationary modelling approach which would not inform the stationary water balance model for the existing condition (i.e., No-KUG model), as well as during all phases of the KUG Project (i.e., With-KUG model), where the KS TSF is full (i.e., steady-state water level). *References:* *AMEC. 2007. Kemess Mine Tailings Storage Facility – South Abutment Evaluation: Progress Update. AMEC File: VM00156.*	5-Aug-16
TKN-063.1	7-Sep-16	SEA on behalf of TKN	Water (Quality & Treatment)	Background: During the August 23, 2016 working group meeting, AuRico committed to providing a description for how the mine contact water flows were calculated. Information Requirment: Describe how the mine contact water flows were calculated. Describe how the historical data were used (quantitiatively and/or qualitatively) duirng the water balance development.	Response is provided in memo **20161018_A.1 KUG Comments TKN-063.1, 064.1a, 072.1_Water Balance_Memo**	28-Oct-16
TKN-064	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.12.2 Mine Derived Flows Overview Because the mine derived flows make up the source terms in the water quality model, it is critical that information on how those flows were derived, when they occur, and how they were combined with background streamflow in the water balance model is clearly presented. EA Information Requirement SEA recommends that AuRico complete the following: • Provide a water balance summary for each modelled node in the Attichika drainage basin for the base case simulation (from operations through post-closure). A table of annual flows (in L/s) should be presented with a time series plot of the monthly flows. The summary should include: o background streamflow (non-contact water); o individual mine derived flows reporting to the node (including KS components); o total "With-KUG" streamflow at the modelling node; and o total "No-KUG" streamflow at the modelling node. • Describe how the individual mine derived flows were calculated. Including flows from the KS mine components (e.g., NAG WRD, KS TSF Pond, KS TSF Seepage, etc.).	The response is provided in memo **20160805_KUG Comment TKN-064,066_Water Balance_Memo**.	5-Aug-16
TKN-064.1a	7-Sep-16	SEA on behalf of TKN	Water (Quality & Treatment)	Background: During the August 23, 2016 working group meeting, AuRico committed to providing a description for how the mine contact water flows were calculated. Information Requirment: Describe how the mine contact water flows were calculated. Describe how the historical data were used (quantitiatively and/or qualitatively) duirng the water balance development.	Response is provided in memo **20161018_A.1 KUG Comments TKN-063.1, 064.1a, 072.1_Water Balance_Memo**	28-Oct-16
TKN-064.1b	7-Sep-16	SEA on behalf of TKN	Water (Quality & Treatment)	Action Item #7 from the Aug 23 meeting: Provide the proportional flows to Waste Creek from 1) the TSF; and 2) the leach cap at Closure.	The response is provided in memo **20160907_A.1_KUG Comment TKN-064.1_Round2_WRC_Memo**	9-Sep-16

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TKN-065	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.12.3 KUG TSF Water Balance Results Overview The KUG TSF will be the primary water and waste management facility throughout the mine life. Additional information about the KUG TSF model output would demonstrate that the proposed water management system will perform as required given the expected inter-annual variability in precipitation and flows at the site. EA Information Requirement SEA recommends that AuRico complete the following: • Modify the time-series plot (EAC Application, Figure 2.5-5) to show how the KUG TSF performed for the base case simulation (i.e., variable flow and precipitation), rather than for the average annual simulation. Replace the "Water Elevation (average)" line with the water surface elevation from the base case simulation. Replace the "Water Elevation (100 yr)" line with the maximum water level that was calculated in GoldSim among all model realizations that were run. • Provide a water balance table showing base case annual flows (in L/s) for the KUG TSF including all modelled inflows and outflows. Each mine phase should be presented. To simplify the table, it may be appropriate to present only one (or a few) representative years during post-closure rather than all post-closure years.	The response is provided in memo **20160805_A.1 KUG Comment TKN-065_Water Balance_Memo.**	5-Aug-16
TKN-066	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.12.4 Conceptual Model for Water Management Overview It would be helpful if the modelling points were shown on the conceptual modelling diagrams to help a reviewer understand how the modelling points are related to the various mine loading sources and how the modelling points are related to each other. EA Information Requirement SEA recommends that AuRico complete the following: • Show the location of the water quality modelling prediction points on the conceptual diagrams (EAC Application, Figure 1.3-1 to Figure 1.3-6). • Label the modelling points with a shortened name (e.g., their water quality sampling station name) such that the figures are not cluttered with the descriptive names of the prediction points.	The response is provided in memo **20160805_KUG Comment TKN-064,066_Water Balance_Memo**.	5-Aug-16
TKN-067	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.12.5 Post-Closure Leakage from the Declines Overview Following operations, bulkheads (i.e., plugs) will be installed at the decline portals to facilitate flooding of the underground. Leakage from the bulkheads will be a likely source of perpetual mass loading into the receiving environment during post-closure. Mass loading due to leakage should be accounted for in the water quality predictions. EA Information Requirement SEA recommends that AuRico complete the following: • Develop an estimate for bulk head leakage flow rate and water quality and account for leakage in the water quality model for the post-closure phase.	An estimated range for flow from the three declines is in the order of 3 to 10 L/s (**A.1 - KUG Comments_MOE-013,014,015,017,018,070_SW_WQ_Memo.pdf**). The leakage, if it occurs, is predicted to occur in year 2053, 19 years after closure begins. If the 10 L/s leakage (i.e., the upper bound of the estimates range) occurs, the leakage can be up to 55% of the flow in El Condor Creek during the winter low flow, and 2% during freshet. The El Condor watershed is approximately 6% of the Kemess Creek watershed at WQ01. The upper bound of leakage at WQ01 can be up to 4% of flow during low flow periods, and less than 0.5% during peak flow.	5-Aug-16
TKN-067.1	7-Sep-16	SEA on behalf of TKN	Water (Quality & Treatment)	The workging group plans to meet and discuss this issue on September 8, 2016.	Post-closure leakage through or around the decline closure plugs was discussed during the September 8 Water Sub-Working Group meeting and resulted in an action item related to clarifying potential flow rates in the event of leakage or a failure of the plug; identify valued components that may be affected and put together a conceptual contingency plan for plug leakage/ failure. The supplemental information presented in **20161109_A.1 KUG_Action Item#2_Sept 8 2016_Declines Closure Water Mgmt_Memo** address this action item.	10-Nov-16
TKN-068	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.12.6 Contaminants of Potential Concern Overview In general, the set of modelling input and output values presented in the EAC Application is comprehensive. However, large multi-page tables of modelling input / output in the main body of the EAC Application can render the report unclear. It would be beneficial if water quality results were limited to a smaller set of water parameters for presentation throughout the main text of the EAC Application, with the full suite of input and output values presented in an appendix. EA Information Requirement SEA recommends that AuRico complete the following: • Clearly identify CoCs associated with the KUG. Those could be identified as parameters that have already exceeded water quality standards and guidelines as a result of the KS mine or that are naturally elevated. CoCs can also be identified as those requiring mitigation as part of the KUG project, and/or those that were predicted to exceed water quality standards and guidelines in the receiving environment as a result of the KUG project. A meeting should be scheduled with TKN to discuss appropriate CoCs. • Present the water quality output for CoCs in the main body of the EAC Application and present the results for the full suite of modelled parameters in an appendix.	The contaminants of potential concern (COPCs) in surface water associated with the Project are presented in the main body of the Application. Tables 11.6-5 and 11.6-6 in Section 11.6.2.1 of the Application provide this information, and include the frequency of exceedance, predicted concentrations, and natural variation during base case and upper case water quality modelling scenarios. The full modelling results are presented in Appendix 11-D.	5-Aug-16
TKN-069	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.12.7 Water Quality Model Calibration Results Overview The "No-KUG" model appears to have been calibrated by replicating concurrent historical flow data and water quality data. Additional information would clarify how the historical data were used and how the calibrated output compared to the monitoring data points. EA Information Requirement SEA recommends that AuRico complete the following: • Provide a time-series plot for a single water quality parameter to present the output from the calibration run. The plot should include modelled monthly water quality and the historical water quality data. • Specify which input assumptions were adjusted to produce the calibrated model. Specify how those calibrated input assumptions were applied in the predictive modelling scenarios.	Model calibration was performed for inputs into the water quality model, including numerical hydrogeological modelling, water balance modelling (Section 2.0 of Appendix 11-D), and synthetic time-series data representing surface flows and precipitation (Appendix 7-E, Appendix 10-A, Section 2.3.3 of Appendix 11-D); calibration runs of water quality model outputs was not performed. Outputs of the water quality model baseline were validated against existing conditions, as discussed in Section 3.2.2 Appendix 11-D. A summary of the comparison of model baseline and existing conditions is presented in Table 3.2-2 through Table 3.2-6. Results indicate that the majority of predicted water quality parameters are similar to actual observed water quality over the same period and exhibit the same seasonal trends in variability, which is an indicator of a good model fit. Moderate exceptions largely reflect the imposition of variable case hydrology as base case, and conservatisms with respect to the mass balance, which resulted in an overestimation of some water quality parameters.	5-Aug-16
TKN-070	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.12.8 Verification of Water Quality Model Results Overview Model verification was presented in the EAC application by way of Tables 3.2-3 to 3.2-6 to compare summary statistics for monitoring data with statistics from the calibrated water quality model output. In general, these tables indicated that the median observed values provide a good fit with the modelled median values. EA Information Requirement SEA recommends that AuRico complete the following: • Describe how the statistics were calculated for the modelled output and from the monitoring data. • Indicate whether the dataset of modelled data was equal in size to the monitoring dataset.	As described in Section 3.2.2 of Appendix 11-D, predictions representing existing conditions were generated on a monthly basis assuming a non-development scenario to focus the assessment on incremental changes predicted to occur specifically as a result of Project development. Use of the model background is also necessitated by the application of variable hydrology in the base case, and to support assessment of surface water flow sensitivity cases. Model validation of the non-development scenario was informed by the comparison of monthly median base case predicted water quality to monthly median observed (i.e. measured exiting) water quality for assessment model nodes on Attichika Creek (WQ-18), Thutade Lake (KN-TL), Attycelley Creek (KN-07) and the Finlay River (KN-15). The results of these comparisons are presented in Table 3.2-2 through Table 3.2-6. Table 3.2-1 summarizes available monthly data for each water quality monitoring station represented in Table 3.2-2 through Table 3.2-6; average concentrations were used where N<3 available monthly samples. Median monthly predicted concentrations under the No-KUG scenario was compiled from results across the full model run (64 monthly timesteps for each month) as to capture the entire long-term synthetic time-series for precipitation and runoff (Sections 2.3.1 and Section 2.2.1). This is larger in size than the monitoring datasets (Section 3.4).	5-Aug-16
TKN-071	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.12.9 East Dam Runoff Source Term Overview The EAC Application describes modelling source terms in Table 3.3-1, which included a term for East Dam Runoff. That source term was apparently intended to represent the loading from the tailings beach into the KUG TSF Pond. It was not clear in the EAC application whether runoff from the downstream face of the East Dam (into Kemess Creek) was accounted for in the water quality model. EA Information Requirement SEA recommends that AuRico complete the following: • Confirm that the model accounted for loading in the runoff from the downstream face of the KUG TSF East Dam and into Kemess Creek.	The geochemical load associated with East Dam surface runoff reports to the KUG TSF in the Water Balance and Water Quality Model (Appendix 11-D); the associated source term was developed using NAG Dump LTP derived to support the KS Mine (KCB 2010). Where Project components/activities are not expected to interact with the surface water quality VC either due to the indirect nature of the interaction or effective well-established best management practices, these components and activities are considered to have no potential effects and are not considered further in the assessment; the predictive water balance and water quality model does not include a geochemical loading from the downs tram face of the East Dam into Kemess Creek.	5-Aug-16

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TKN-072	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.12.10 Loading Equations in the Receiving Environment Overview To accurately assess the KUG, it is critical that the combination of inputs (e.g., background flows, mine derived flows, mine derived loads, and background water quality, etc.) used to calculate water quality at each modelling node is clear. EA Information Requirement SEA recommends that AuRico complete the following: • Show loading equations for each modelling node to indicate how the total flow was calculated, and how the total load was calculated.	The response is provided in the memo **20160805_KUG Comment TKN-072 076_WQ_Memo.**	5-Aug-16
TKN-072.1	7-Sep-16	SEA on behalf of TKN	Water (Quality & Treatment)	adequate response - AuRico plans to provide a description for how mine contact water flows were calcualted in the water balance, which will help support this information requirment	Response is provided in memo **20161018_A.1 KUG Comments TKN-063.1, 064.1a, 072.1_Water Balance_Memo**	28-Oct-16
TKN-073	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.12.11 Time-Series Plots Overview Statistical summaries of water quality model output were tabulated in the EAC Application. However, those tables do not clearly indicate how water quality is expected to change over time. EA Information Requirement SEA recommends that AuRico complete the following: • Include time-series plots for CoCs in the KUG TSF. The plots should show the separate mine phases, and applicable water quality standards and guidelines. • Include time-series plots for CoCs for key modelling points in the receiving environment. The plots should show the mine separate phases, current water quality, and applicable water quality standards and guidelines.	The response is provided in the memo **20160805_KUG Comment TKN-073_WQ_Memo.**	5-Aug-16
TKN-074	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.12.12 Water Quality Results Tables Overview Baseline water quality should be presented in the water quality results tables of the EAC Application (Tables 3.5-3 to 3.5-7) to illustrate the expected changes in water quality during each mine phase. EA Information Requirement SEA recommends that AuRico complete the following: • Add baseline water quality data to each of the water quality results tables (Tables 3.5-3 to Table 3.5-7).	Appendix 11-D is the Water Balance and Water Quality Modelling report. The objective of this report is to describe the surface water quality model developed to support the Application including general model assumptions and inputs into the surface water quality model, detailed assumptions for each Project component, sensitivity model cases, and results of predicted water quality and water balance modelling. The assessment of potential residual effects to surface water quality, including an evaluation of predicted concentrations relative to existing water quality, is presented in Chapter 11 (Surface Water Quality Effects Assessment). Supplementary information requested here regarding additional presentation of model predictions relative to existing water quality are presented in memo **20160805_KUG Comment TKN-073_WQ_Memo.**	5-Aug-16
TKN-075	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.12.13 Mitigating Effects of the Proposed Treatment Systems Overview SEA understands that the proposed water treatment systems will be used to manage water quality parameters from construction through closure. It is not clear in the EAC Application which parameters will require water treatment in order to achieve applicable water quality standards and guidelines and water quality objectives for the receiving environment. EA Information Requirement SEA recommends that AuRico complete the following: • State which water quality parameters will rely on water treatment in order to maintain water quality below applicable water quality standards and guidelines and the water quality objectives for the receiving environment. • Describe the purpose of the selenium treatment system and provide the rationale for not using this system following closure. • Describe what the sources of selenium are that the selenium treatment system will be treating during operations.	Water treatment represents the primary surface water quality mitigation and management strategy for the Project and will be focused at the KUG TSF and related discharges. Extensive consultation and discussions between TKN and AuRico since December 2014 helped define a process to engage TKN in the assessment of water management and eventual selection of the preferred discharge alternative (Section 11.5.1.1; Appendix 4-D). The planned discharge schedule and proposed water treatments, including the selenium treatment system, are presented in Appendix 5-C (Laboratory Testing Reports and Memorandum Regarding Water Treatment at the Kemess Underground Project), and Appendix 11-D (Water Balance and Water Quality Modelling Report). The metals removal (MR) treatment process will be used for managing dissolved metal concentrations in discharges from the KUG TSF during Operations and Closure (Figures 1.2-3 to 1.3-4 of Appendix 11-D); a Se-IXTM treatment process will be used for managing selenium concentrations in contact water from the SeCP (Construction, Figure 1.2-2, Appendix 11-D) and of discharges from the KUG TSF (Operations, Figures 1.2-3 to 1.3-4, Appendix-11-D). Both the MR and Se-IXTM treatment processes are currently being developed by BioteQ Environmental Technologies (BioteQ); the design basis for proposed water treatments was developed based on existing water quality of the KUG TSF, predictions of influent water chemistry, and expected effluent permit concentration conditions (Appendix 5-C). Predicted influent water chemistry (equivalent to 95th percentile values of base case predictions of the KUG TSF) was provided to Biota to inform laboratory-scale water treatment testing and water treatment (see Table 3.2-7 of Appendix 11-D). The proponent is committed to ensuring that effluent is not acutely lethal at end of pipe and that chronic toxicity does not occur at the end of the IDZ, consistent with BC MOE policy and practices for permitting of effluent discharges under the Environmental Management Act. Based on this influent chemistry, the following parameters were targeted for water treatment: aluminum, arsenic, cadmium, cobalt, copper, iron, lead, molybdenum, selenium, silver and zinc. The proposed cessation of water treatment in Closure (Se-IX) and Post-Closure (MR) corresponds to period when it is predicted that water quality of the KUG TSF is of suitable quality for discharge. Water quality monitoring of the KUG TSF and the receiving environment will be ongoing in Construction, Operations, and Closure and will service to validate water quality predictions. If monitoring indicates that KUG TSF is not of suitable quality, contingency measures can be initiated; for example, extension of active water treatment.	5-Aug-16
TKN-075.1	7-Sep-16	SEA on behalf of TKN	Water (Quality & Treatment)	Background: During the August 23, 2016 working group meeting, AuRico presented the methodology that was followed to determine which water qulaity parameters may need treatment. Informaiton Requirement: Provide the presentation slides that were used during the August 23 2016 working group meeting that were used to describe the methodology for selection of treatment process.	The design basis for proposed water treatments was developed based on existing water quality of the KUG TSF, predictions of influent water chemistry, and expected effluent permit concentration conditions (Bioteq 2015a,b,c; Appendix 5-C of the Application). The slides from the August 23, 2016 Working Group meeting were provided to the EAO on September 1, 2016 for upload to the Working Group sharepoint site (memo **20160823_KUG Comment TKN-075.1_Water Treatment_Presentation**). References: BioteQ 2015a. Metals Removal from Kemess Pit Water, Laboratory Testing-Final Report. Prepared For AuRico Gold by BioTeQ Environmental Technologies. BioteQ 2015b. Selenium Removal from Mine Impacted Water Collected at the Kemess Mine using Selen0IXTM , Laboratory Testing Report. Prepared For AuRico Gold by BioTeQ Environmental Technologies. BioteQ 2015c AuRico KUG solid byproducs results from water treatment. Memorandum prepared For AuRico Gold by BioTeQ Environmental Technologies.	28-Oct-16
TKN-076	26-Jun-16	SEA on behalf of TKN	Water (Quality & Treatment)	SEA (June 20, 2016) - Section 3.12.14 Individual Loading Sources Overview To fully understand the potential effects and impacts of the KUG, loading sources that are predicted to have the largest influence on downstream water quality should be clearly indicated. EA Information Requirement SEA recommends that AuRico complete the following: • Provide a table for each key prediction point in the receiving environment that shows the relative proportion each loading source would have on total loading. o The table should include, at minimum, the water quality parameters of potential concern (see Table 1 in SEA June 20, 2016 SEA memo for an example). o The values in the table should be based on total annual loading for a representative year. o A table should be presented for each mine phase.	The response is provided in the memo **20160805_KUG Comment TKN-072 076_WQ_Memo.**	5-Aug-16
TKN-076.1	7-Sep-16	SEA on behalf of TKN	Water (Quality & Treatment)	Background: AuRico's consultants provided time series plots showing a breakdown of loading sources. However, the individual mine derived sources were not presented. Therefore it was not possible to understand which loading sources are the major contributors. Information Requirement: Tables for each key prediction point in the receiving environment should be developed to show the relative proportion each loading source on total loading. The tables should be developed as requested in the original information requirment TKN-076.	The model results being requested here have been previously provided in the following memoranda: -20160508_KUG Comment MEM-066_WQ_Memo -20160805_KUG Comment MEM-067_WQG_Memo -20160805_A.1 KUG Comment TKN-072 076 Loading Sources_Memo The figures distributed in these memos present for each key prediction point in the receiving environment, for each individual mine-derived source, the absolute loading rate (mg/s) and the relative proportion (%) over the entire life of mine.	7-Sep-16
TKN-077	26-Jun-16	SEA on behalf of TKN	Accidents and Malfunctions	SEA (June 20, 2016) - Section 3.13.1 Moderate Risk Events Impact on TKN Overview AuRico analyzed the moderate risk events on VCs and found that they would not have a significant effect. Significance was determined based on magnitude, duration, geographic extent, reversibility, resiliency, ecological or social context, residual effects and likelihood of the event. Impacts on TKN were not given sufficient weight in this analysis. For example, a leak or spill of a hazardous substance could easily result in fish mortality. Because the spill may be cleaned up rapidly and the fish may eventually re-populate the area, the risk was determined to be "not significant". However, the impact to TKN may be very significant, not just with respect to the loss of fishing, but also due to other factors, including the loss of cultural connection to a resource. The community wellbeing could also be jeopardized if risk events damage the environment. Additionally, there may be the perception of an area being irreversibly damaged and avoided. EA Information Requirement SEA recommends that AuRico complete the following: • Schedule a meeting with TKN to seek guidance on the potential effects and impacts of risk events on values important to each of the TKN Nations.	AuRico continues its ongoing communication with TKN leadership regarding TKN participation in site monitoring during operations & closure; TKN members will be members of the Environmental Management Committee that is expected to participate in discussions on the potential effects and impacts of risk events on values important to TKN (i.e. included as part of IBA).	5-Aug-16

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TKN-078	26-Jun-16	SEA on behalf of TKN	Accidents and Malfunctions	SEA (June 20, 2016) - Section 3.13.2 Surplus Contact Water *EA Information Requirement* SEA recommends that AuRico complete the following: • Conduct an FMEA for the case where there is too much mine contact water and no ability to discharge. • Develop contingency plans for the the above-mentioned this scenario. • Provide meaningful opportunities for TKN to participate in the FMEA study and contingency planning.	The FMEA did consider several failure modes related to excess water in the KUG TSF (such as dam over-topping, release of off-spec water). Due to storage capacity within the pit, excess contact water compared to expected volumes of contact water is a scenario that can be monitored and managed over a relatively long period of time rather than short duration, unexpected, and episodic events that are addressed through FMEA completed for the Application. The KUG TSF (former KS Pit) will be drawn down during the construction phase to provide storage capacity in advance of mine operations, thereby generating substantial storage capacity for all mine contact water. In addition, a positive Operational water balance, that incorporates mining operations and discharge of waters (treated) during operations, demonstrates appropriate storage capacity within the KUG TSF, even with only discharging for six months per annum. In addition, near the end of mine life the permanent discharge spillway will be constructed in advance of predicted discharge. AuRico believes mine contact water has been appropriate addressed and additional FMEA is not necessary.	5-Aug-16
TKN-079	26-Jun-16	SEA on behalf of TKN	Accidents and Malfunctions	SEA (June 20, 2016) - Section 3.13.3 Long-Term Condition of the Proposed Post-Closure Bulk Head Overview The proposed decline bulkhead could eventually leak in the post-closure phase, creating corresponding effects and impacts. EA Information Requirement SEA recommends that AuRico complete the following: • Indicate where the water would flow to form the bulkhead in the event of a failure. • Conduct an FMEA for the case where there the bulk head fails.	The Portal Declines are located in the Kemess Lake valley watershed and not in the Amazay Lake Watershed. Therefore, in the event of water leakage for the triple declines, i.e. not controlled and directed to the water containment structures, the flow would report to Upper El Condor Creek.	26-Aug-16
TKN-079.1	7-Sep-16	SEA on behalf of TKN	Accidents and Malfunctions	Background: AuRico's response did not include discussion around a Failure Modes Effects Assessment (FMEA) for the portal. Information Requirement: Provide a FMEA for a portal failure scenario or provide justification for why the FMEA was not carried out for this type of event?	The risk of a partial or complete failure of the decline plug during Post-Closure would be considered to have a 'Moderate' Environmental Consequence, and the Likelihood of the failure is considered 'Rare'. Being ranked as a low risk (L17), the event would not have been discussed further in the Application. However, supporting background information for the low risk nature of the partial or complete failure of a decline plug is presented in responses to ECCC-065 and MoE-070 and **20161109_A.1 KUG_Action Item#2_Sept 8 2016_Declines Closure Water Mgmt_Memo.** The latter memo identifies a number of conceptual contingency measures that can reasonably considered to be feasible and effective in mitigating potential future environmental effects, if this is necessary. No contingency measures related to water management for closure of the declines would be necessary until mine closure, and AuRico has committed to progressively evaluate potential risks through mine operations such that site-specific operating data can provide the basis of the evaluations.	10-Nov-16
TKN-080	26-Jun-16	SEA on behalf of TKN	Environmental Management Plan	SEA (June 20, 2016) - Section 3.14.1 Finalization of the EMPs Overview The Environmental Management Plans (EMP) in the EAC Application provided conceptual, high level overviews of the proposed systems that AuRico intends to put in place. While the EMPs have incorporated Best Management Practices and the appropriate guidance documents into their framework, the bulk of the details have been left to the permitting phase. Proposed EA Condition If approved, SEA recommends the following as an EAC Condition: • Ensure that TKN is provided a meaningful opportunity to participate in the preparation and implementation of the EMPs.	AuRico continues its ongoing communication and dialogue with TKN leadership and includes such topics as TKN participation in development of EMPs (i.e. included as part of IBA). There is no need to set as Certificate Condition.	5-Aug-16
TKN-080.1	7-Sep-16	SEA on behalf of TKN	Environmental Management Plan	Background: TKN appreciates the level engagement that AuRico has provided to TKN to date. While TKN believes that AuRico will continue to involve TKN in relevant project issues in the future, there is the possibility that another owner will take over the mine and become the holder of the EAC at some future date. For that reason, First Nations engagement should be written into the EAC Conditions such that any future EAC Holder will be required to involve TKN in decision making in terms of environmental management issues that could affect TKN interests. Recommendation: The EA Conditions should state that that the EAC Holder shall make reasonable effort to engage the TKN prior to submission of the required monitoring plans and mine design revisions that will be required for permitting.	with EAO	28-Oct-16
TKN-081	26-Jun-16	SEA on behalf of TKN	Environmental Management Plan	SEA (June 20, 2016) - Section 3.14.2 Emergency Response Plan (ERP) Overview AuRico has committed to ensuring that there will be adequate funds provided in the annual budget for Emergency Response Plan (ERP) related activities. During an emergency, AuRico has set out three levels of response, depending on the type of emergency: containment, notification and mobilization. After an emergency incident, the ERP Coordinator would launch an investigation with relevant health and safety personnel to analyze the root cause. All emergency reports will be forwarded to the relevant government agencies. Proposed EA Conditions If approved, SEA recommends the following as an EAC Condition: • Secure adequate funding for the TKN's participation in ERP activities. • Secure adequate funding for ERP activities, including funding for training, equipment, and annual reviews in the event of temporary closure. • Immediately contact TKN in the event of an emergency. • Consult with, engage, and include TKN in the follow up investigations after an emergency event. • Promptly provide TKN with all emergency reports that must be sent to government agencies.	AuRico continues its ongoing communication with TKN leadership regarding TKN participation in site monitoring during operations & closure; TKN participation in development of EMPs (i.e. included as part of IBA), and this engagement will include TKN's participation, reporting and notification procedures regarding ERP. There is no need to set as Certificate Condition.	5-Aug-16
TKN-081.1	7-Sep-16	SEA on behalf of TKN	Environmental Management Plan	Background: TKN appreciates the level engagement that AuRico has provided to TKN to date. While TKN believes that AuRico will continue to involve TKN in relevant project issues in the future, there is the possibility that another owner will take over the mine and become the holder of the EAC at some future date. For that reason, First Nations engagement should be written into the EAC Conditions such that any future EAC Holder will be required to involve TKN in decision making in terms of environmental management issues that could affect TKN interests. Recommendation: The EA Conditions should state that that the EAC Holder shall make reasonable effort to engage the TKN prior to submission of the required monitoring plans and mine design revisions that will be required for permitting.	with EAO	28-Oct-16
TKN-082	26-Jun-16	SEA on behalf of TKN	Environmental Management Plan	SEA (June 20, 2016) - Section 3.14.3 Mine Waste, Tailings and ML/ARD Management Plan Overview All waste rock generated at the KUG was assumed by AuRico to be PAG and will be placed subaqueously in the KUG TSF. However, the summary section of the Mine Waste, Tailings and ML/ARD Management Plan states that if the waste rock is deemed to be NAG then it may be used in construction. EA Information Requirement SEA recommends that AuRico complete the following: • Describe the testing that will be done to ensure the correct classification and segregation of waste rock. Describe why KUG waste rock will be used in place of NAG material from the East Pit Quarry or the KS Mine Main NAG Dump (both of those areas have already undergone testing and classification programs). • If the KS quarry and NAG dump materials are used for construction, indicate whether there be testing carried out to segregate the KUG waste rock into PAG and NAG. • Demonstrate using water balance modelling output that the PAG causeway material are expected to remain submerged during dry periods. • Describe the Post-Closure monitoring system that will be in place to reduce the likelihood of snow and ice blockages during winter in the KUG TSF emergency spillway.	The current mine plan assumes that all KUG waste rock is PAG and will be stored subaqueously in the pit. However, in the future if KUG waste rock is indicated to be NAG, it may be beneficial to utilize it in construction to reduce disturbance to previously reclaimed areas in the EPQ and NAG Dump. However, if this (currently unplanned) decision is undertaken, the KUG waste rock would be subjected to the same testing and classification standards as the EPQ and NAG Dump, which are the current expected sources for all KUG TSF construction material. Water balance modeling indicates that the KUG TSF will operate with a net positive water balance, hence the design for water treatment and discharge and a spillway in closure. In closure, the pond level will be controlled by the elevation of the spillway outlet, and given the positive water balance, no significant long term variation is expected in the water level. The waste rock causeway, the top of which will be over 20 m below the pond elevation and buried in tailings, will therefore remain saturated in perpetuity to inhibit ARD generation. The net positive water balance for the pit is indicated by water balance models, but more definitively, it is indicated by the observed water level rise in the pit since the cessation of mining in 2011. Post-closure monitoring requirements of the KUG TSF Spillway have not been explicitly defined as part of the feasibility level design, however, it is assumed that they will be similar to the stringent monitoring requirements for the existing closed KS TSF. Monitoring of the KS TSF Spillway consists of flow, temperature, and water level gauges, with remotely accessible cameras in place for when the site presence is reduced and manual inspections are less frequent. As well, a low-level outlet to allow for continued discharge in freezing conditions is installed in the spillway control structure. Owing to the location of the KUG TSF Spillway (excavated in bedrock over a kilometer from the East Dam), overtopping of any blockage would occur distant from the dam itself and not be a significant threat to dam safety.	5-Aug-16

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TKN-083	26-Jun-16	SEA on behalf of TKN	Environmental Management Plan	SEA (June 20, 2016) - Section 3.14.4 Water Treatment Plan Overview The purpose of the Water Treatment Plan is to provide the rationale, framework and scope of the proposed treatment systems for the KUG. While the framework and scope are provided in this plan, there is no rationale provided. EA Information Requirement SEA recommends that AuRico complete the following: • Provide the rationale for the Water Treatment Plan, specifically the performance objectives for the selenium and metals removal treatment during each phase of mine life. • Describe why the metals and selenium treatment systems have some of the TSF outflow bypassing them at different stages of the mine life. • Describe how quickly the monitoring program will be able to detect exceedences (if any) in parameter target levels for both the selenium and metals treatment plants.	The Water Treatment Plan was developed to provide guidance for the operation of the water treatment plants throughout the life of the Project. The plan will be used to ensure continuity of the management of water treatment facilities by operating personnel. During Construction, Operations and into Closure until no longer needed, contact water directed to the treatment plants will be treated to meet acceptable water quality criteria prior to discharge. The Water Treatment Plan and a corresponding monitoring program will be further developed as part of the permitting process. The water treatment requirements for the discharge of water from KUG TSF involves two separate treatment steps to achieve acceptable water quality for discharge to the receiver, (a) selenium treatment and (b) metals removal treatment. To achieve acceptable discharge water quality it does not require the same volume of water to be treated in each step, hence Se treatment at 50 l/s and Metals treatment at 120 l/s. Therefore, a volume of water will by-pass the Se treatment during the operation phase(s) and closure; and a volume will by-pass metals treatment during Year 1 Operations. Rapid analysis of trace metals can be done with bench top units but they are not designed to replace 3rd party analytical labs to prove regulatory compliance. Operating plants typically use a Hach spectrophotometer to do analysis of effluent in order to get fast feedback between effluent and process control. This approach is suitable for most metals but not selenium, which would require a different bench top device. When operating a plant, a database of knowledge about water chemistry and indicators is built. This is completed by tracking historical analytical results as well as process control variables that can be tracked in real time such as pH, ORP, and conductivity. By correlating the two, trends of metal concentrations with real time measurements become apparent. Using this knowledge we can infer when exceedances occur and make informed choices about how to change the plant operation to get things back on track without waiting for 3rd party analytical results.	5-Aug-16
TKN-084	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Please provide rationale as to why both types of habitat modelling were completed and why ecosite rating tables based on ecosites don't show similar rates for habitat. For example, ecosite PL (02) is rated as 1 or 2 for caribou depending on season in capability mapping while same ecosite is rated from 3 to 5 for structural stage 6 depending on season in suitability mapping. It is assumed that under optimal seral conditions that capability and suitability ratings should be close. This clarification applies to all VCs where capability and suitability mapping was completed.	Capability mapping was conducted to inform closure planning. Suitability mapping was conducted to inventory current habitat conditions. Suitability is different from capability. Capability refers to habbtat potential while suitability refers to the current condition of habitat. With respect to the example, Spruce Willow Birch (SWB) and Boreal Altai Fescue Alpine (BAFA) biogeoclimatic zones (BEC) represent the majority of the LSA, where a mapped 02 site occurs in the SWB (as interpreted from the vegetation mapping) it would be expected to have lower value than an 02 in the lower elevation Boreal White and Black Spruce (BWBS) BEC as ratings were regional and their considered value with respect to the RSA. Relative to a structural stage 7 02 in the BWBS which would have a combination of terrestrial and arboreal lichen and lower snow pack for ease of cratering as well as taller stems and greater canopy effects, rating an 02 structural stage 6 in the SWB as a 3 (moderate value) is appropriate consistent with low elevation winter attributes identified in Environment Canada (2014). Consistent with high elevation winter range vegetation attributes, a structural stage 6 02 would not have the windswept ness associated with clearing snow and exposing terrestrial lichen as the more highly suitable dry sites in the BAFA would, in this case a habitat suitability rating of 4 is an appropriate rating. As identified in the literature cited in species account, calving (i.e. birthing) in the northern population is associated with open, early seral vegetation. Structural stage 6 is forested and a habitat suitability rating of 5 for a 02 site in the SWB is appropriate for reproducing. Environment Canada. 2014. Recovery Strategy for the Woodland Caribou, Southern Mountain population (Rangifer tarandus caribou) in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa, ON	5-Aug-16
TKN-084.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	The example provided referred specifically to SWBmk/02 (PL) or not just ecosite PL (02) of other zones and there appeared to be some discrenpancies between rating values. The capability mapping for MRATA_U_WE is one (high) while the suitability mapping for MRATA_U_WE Structural stage (SS) (1) is 4 (Low), SS3 is 4 (low), SS4 is 3 (Moderate), SS5 is 3 (Moderate), and SS6 is 3 (Moderate). It was assumed that one of the structural stages would provide the same rating as the capability rating or within 1 rating unit (under similar seral conditions capability and suitability ratings should be similar). While capability species accounts states that age class 1 - 4 in forested ecosystems have minimal winter value for feeding because both terrestrial and arboreal lichen loads are low but the suitability mapping has SS1 and SS3 rated as 1 (high) for MRATE_U_WL and SS4, SS5 and SS6 have a rating of 4 (Low). Regardless, no further action required.	Comment acknowledged.	4-Nov-16
TKN-085	26-Jun-16	C.Coady, EDI	Wildlife and habitat	It does not appear that ground-truthing was performed for the habitat suitability modeling which is an important step in model development. Specific to caribou, lichen sampling was also not performed, which can improve accuracy of modeling for this lichen-dependent species. Please provide information on why ground-thruthing was not performed for all widlife habitat suitability modeling and also provide information for why lichen sampling was not performed specific to caribou habitat modeling.	This is correct that ground truthing was not conducted to evaluate habitat suitability models. The high elevation winter model for caribou was extended from a model developed in the Kutcho Creek watershed that identified 95% of caribou being observed in late winter habitat rated as high and moderately-high in the Kutcho Creek drainage (Rescan 2008). Lichen sampling was completed for the Project; eleven arboreal lichen plots were completed in habitats rated as high value winter habitat caribou along Attycelley Creek (p. 11-6, 11-7 (Methods), p. 11-14, 11-15 (Results and Discussion)). These plots were carried out to determine the relative abundance of arboreal lichens available for caribou within the areas used during the winter. Rescan. 2008. Kutcho Project Wildlife Habitat Suitability Baseline Report. Prepared for Kutcho Copper Corporation by Rescan Environmental Services Ltd. November 2008.	5-Aug-16
TKN-085.1	10-Oct-16	C.Coady, EDI	Wildlife and habitat	Although a response for caribou was provided, rationale on why no habitat suitability ground-truthing was completed for any of the other selected species as defined in standards for wildlife habitat ratings (RISC 1999) was not provided. Please provide rationale for all other species.Please also specify why only arboreal lichen sampling was completed since species accounts identify that terrestrial lichens are also used and terrestrial lichens are often TEM ecosite indicator plants while arboreal lichens are not.	Habitat suitability mapping ground-truthing was not completed for any of the selected species. Model assumptions were used that had been previously developed and ground-truthed for other projects in northern and north-west BC (see **20160706 KUG Comment FLNRO-121, 122_Caribou_Memo**). Due the relatively small project footprint, the associated uncertainty in following this methodology was deemed acceptable in relation to the time and financial considerations associated with completing a ground-truthing exercise specific to the suitability models. At the request of the MFLNRO, a verification of the habitat suitability modelling for the Project was conducted by comparing animal and sign observations to the model results. A memo **20161020_KUG Comments_FLNRO 024.1_habitat suitability_Memo** provides the results to support improved confidence in the habitat suitability modelling. The results of the verification indicated that most models predicted animal use well (with larger numbers of animals observed in higher rated habitats), although caution was warranted as baseline data was not collected in a manner that was specifically designed to field-truth models (see Memo **20161020_KUG Comments_FLNRO 024.1_habitat suitability_Memo** for details). Sampling specifically for terrestrial lichens was not conducted for the Project. However, a number of ground based assessments were conducted for vegetation and wildlife that were used to collect information and verify terrestrial ecosystem mapping (TEM) produced for the Kemess South, Kemess North, and Kemess Underground Project (Appendix 15-A). Ground based assessments were performed in caribou winter habitat in the winter and in the snow-free season (p. 11-6 to 11-7, Appendix 15-A). During these and other ground based assessments to ground thruth the TEM, terrestrial lichen forage was noted, e.g., p. 11-14 "Caribou use was rated High in the AL and PL ecosystems, which had terrestrial lichen ground covers greater than 60%, and where the number of sign per 100 m of transect was greater than 10 observations." and "Areas without high proportions of Cladonia and Cladina type lichens did not contain high levels of sign, and did not appear to be used during the winter". Hence, the distribution of ecosystems containing terrestrial lichen forage are well known from the TEM, upon which habitat suitability models are based.	10-Nov-16
TKN-086	26-Jun-16	R. Robitaille, EDI	EA Methods	The Proponent states that there is no residual effect but do not provide any information on how they define a residual effect. There should be quantifiable references that define thresholds for significance of habitat loss. These should be based on literature where possible. This request applies to all wildlife VCs that show a loss of habitat but loss of habitat was not carried forward as a residual effect in the effects assessment.	The Project footprint area includes 487 ha, where < 100 ha is due to the infrastructure itself and the remaining area is due to buffers around infrastructure. The additional area was included in order to account for final siting changes as well as habitat alteration due to construction activities around the infrastructure. Therefore, all habitat loss and alteration estimates presented are highly conservative as it is anticipated that as little as 15% of the total Project footprint area will actually be affected. Determination of residual effects was based on both quantitative assessments e.g. habitat loss and alteration and sensory disturbance as well as the knowledge of the species life history information e.g. relative home range size, limiting habitat etc. These together informed determination of residual effects rather than a threshold based approach. The percentage of seasonal high quality habitat lost and altered relative to the habitats available within the LSA was generally less than 10% for animals with large home ranges e.g., caribou, moose, and grizzly bear (except for caribou early winter habitat where up to 18% may be lost or altered), while habitat loss and alteration was generally 5% or less for species with smaller home ranges such as migratory birds (except for olive-sided flycatcher for which habitat loss and alteration was predicted to occur over 7% of the available habitat of the LSA). Since only 15% of the total Project footprint area will actually be affected, these habitat losses equal 1.5-2.8% within the LSA. This degree of habitat loss was considered negligible for all wildlife VECs that were assessed, and were not carried forward as residual effects.	5-Aug-16

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ID #	**Comment Date**	**Reviewer Name / Agency (i.e. Alex Kwang, MEM)**	**Subject (See "instructions" tab)**	**Comment (Include Memo reference as applicable)**	**Proponent Response (Include Memo reference as applicable)**	**Response Date**
TKN-086.1	10-Oct-16	R. Robitaille, EDI	EA Methods	The rationale provided here is appreciated. However, concerns still exist related to habitat loss not being considered a residual effect. Although the proponent has identified that the habitat loss identified is a conservative estimate based on buffer sizes, it is understood that construction activities and final siting may require activities that affect habitat in this buffer area, therefore saying it is less than 15% of the area is most likely not accurate. Specific to caribou, Table 15.6-2 and 15.6-3 identify the high quality habitat within the LSA that is affected by the project from habitat loss/alteration and functional loss. If all of these totals are added together to represent all potential habitat loss, alteration and functional loss for all seasons, the total is 38.7%of the high quality habitat in the LSA is potentially affected. This is just high quality habitat, a more conservative approach would have also factored in moderate or moderate-high quality habitat. Granted not all of the habitat area affected by sensory disturbance is "lost", even at 50% reduced habitat effectiveness, the total area would be 31.5%. Please revise your effects assessment considering this information. Based on this calculation, project effects on habitat should be carried forward as a residual effect for caribou.	Habitat loss was evaluated using a conservative approach which considered that all habitat within buffers of the Project footprint would be altered and that this was the metric used to evaluate whether residual effects would occur. In response to action items assigned during the September 15, 2016 Working Group Meeting, TKN-086 and TKN-24.1), AuRico has prepared a memo regarding what is considered a residual effect or not (**20161103 KUG Comments TKN_WG Meeting Sept 15 2016_Memo**). In the memo AuRico clarifies that the potential effects of habitat loss and alteration, as well as sensory disturbance, were carried forward as residual effects and characterized according to the EAC Application methodology, if the effect resulted in a greater than 5% change in the suitable habitat available in the LSA. For further details, please refer to **20161103 KUG Comments TKN_WG Meeting Sept 15 2016_Memo.** Specific to caribou, it should be noted that habitats of various qualities for caribou during different seasons are not always spatially discrete from one another (i.e., both late winter and spring and summer habitats are located in high elevation areas, and some high quality late winter habitats can also be high quality spring and summer habitats). Therefore, habitat loss and alteration across all seasons cannot be added together to come up with a cumulative total. An analysis of the cumulative amount of habitat loss for caribou across all seasonal habitat available has been conducted, which considers loss of high quality habitat (habitat rated as high and moderately-high during habitat suitability modelling; Appendix 15-9). The results of this analysis indicated that the habitat loss for caribou across all seasons was 3.5% of the available high-quality suitable habitat in the LSA. Sensory disturbance due to instantaneous noise from traffic was calculated to affect the greatest percentage of total combined high quality habitat at 3.5% of available habitat in the LSA (**20161103 KUG Comments TKN_WG Meeting Sept 15 2016_Memo**). In addition, at the request of ECCC, an evaluation of habitat loss and alteration has been conducted using existing and draft critical habitat for caribou; the results of this analysis are presented in memo **20161028_KUG Comment_ECCC-091.1, 093.1, 097.1, 098.1, 115 Memo**	4-Nov-16
TKN-086.2	23-Nov-16	R. Robitaille, EDI	EA Methods	EDI has provided in a separate letter comments on the 20161103 KUG Comments TKN_WG Meeting Sept 15 2016_Memo and memo 20161028_KUG Comment_ECCC-091.1, 093.1, 097.1, 098.1, 115 Memo which includes the recommendation to implement a caribou monitoring and management plan.	The responses to the memo are provided in responses to the comments TKN-304 through TKN-314.	21-Dec-16
TKN-087	26-Jun-16	EDI	Wildlife and Habitat, Fish and Aquatic Habitat and Terrestrial Ecosystems	Kemess East mineral exploration project has been screened out of the CEA and the proponent's rationale states that "Exploration of Kemess East is staged out of the existing Kemess South facilities and the drill platforms are located above tree-line. Existing disturbance was too small scale to be mappable following the methodology applied for other projects and exploration activities. Additionally, application of standard mitigation measures and reclamation measures were identified as being sufficient to result in no residual effects to wildlife VCs; therefore, it was excluded from further consideration in the wildlife CEA. ". Please clarify the statement "drill platforms are located above tree-line, thus disturbance to terrestrial ecosystems is minor." Alpine and Parkland Ecosystems are a VC for the KUG Project and are terrestrial ecosystems. Furthermore, exploration roads and sensory disturbance from drilling, helicopters and vehicles may have an impact on alpine-associated species (mountain goats, upland game birds etc.). Because the proponent does not provide information on the exploration program, the reviewers cannot assess whether it is appropriate to screen out Kemess East exploration program from the CEA. The Kemess East exploration program appears to be highly relevant to the CEA. Please include the Kemess East Exploration Program in the CEA.	The Kemess East was considered amongst other exploration projects in the effects assessment chapters; however, due to the small footprint and assumed low environmental impacts able to be mitigated by standard mitigation practices, it was excluded from detailed cumulative effects assessment. Kemess East, which is staged out of Kemess South, activity is limited to seasonal use (3-4 months) of up to 3 drills and up to 12 people. Helicopter support is limited to shuttling crews to and from accommodations which are staged out of Kemess South. The 2016 Kemess East drill pads are located primarily on talus slopes where no vegetation clearing is required. There are no trees growing at the elevation of the Kemess East exploration sites and the dominant ecosystem consists of sparsely to non-vegetated talus slopes and rocky outcrops. TKN leadership is aware of the program due to agreement in place and direct employment to TKN members. The 2016 exploration program will be the last year for exploration on Kemess East.	5-Aug-16
TKN-088	26-Jun-16	EDI	Fish and Aquatic Habitat and Terrestrial Ecosystems	Given the long time-frame for this project, consideration of climate change should have been included in the cumulative effects assessment. Climate change may impact several VCs within terrestrial ecosystems and aquatic habitat (riparian ecosystems and hydrology). For example, loss of alpine habitat associated with climate change (i.e. encroachment of sub-alpine forests) is quantifiable in the CEA and should be included as a cumulative effect to alpine habitats in the RSA. Please provide rationale for why climate change was not considered in the CEA or include it in the CEA.	The Application was completed in accordance with regulatory framework for undertaking EAs in BC. Within this framework, the scope, procedures, and methods of each assessment are tailored specifically to the circumstances of the proposed project. This approach allows for each assessment to focus on key issues relevant to the project when determining whether or not the project should proceed. When conducting the assessment, AuRico relied on the Guideline for Selection of Valued Components and Assessment of Potential Effects (BC EAO, 2013) and Application Information Requirements (AIR). The BC EAO (BC EAO 2013) states that in BC, the assessment of cumulative effects for reviewable projects should consider other past, present, and reasonably foreseeable projects and activities. Projects and activities are intended to be those driven by human involvement rather than natural phenomena or events. Consideration of climate change impacts on the project are addressed in Chapter 23 of the Application (Effects of the Environment on the Project), which is consistent with guidance from the Canadian Environmental Assessment Agency on incorporating climate change considerations in environmental assessments (CEA Agency 2003). References: BC EAO. 2016. Application Information Requirements for the Kemess Underground Project. Published by the British Columbia Environmental Assessment Office: Victoria, BC. AuRico Metals Inc. 2016. Kemess Underground Project: Application for an Environmental Assessment Certificate. Assembled for AuRico Metals Inc. by ERM Consultants Canada Ltd.: Vancouver, British Columbia. BC EAO. 2013c. Guideline for the Selection of Valued Components and Assessment of Potential Effects. British Columbia Environmental Assessment Office: Victoria, BC. CEA Agency. 2003. Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners. Prepared by the Canadian Environmental Assessment Agency. http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=A41F45C5-1 (accessed July 2012).	5-Aug-16
TKN-088.1	10-Oct-16	EDI	Fish and Aquatic Habitat and Terrestrial Ecosystems	Although not a clear jurisdictional requirement in BC, other jurisdictions appropriately recognize that climate change should be considered in effects assessments. (Bell et al. 2003). The fact that climate change predictions were not factored into the effects assessments indicates that follow up monitoring and management should be required to monitor and adaptively manage project effects on water and wildlife valued components. It is understood that a water monitoring program is a regulatory requirement, however a wildlife monitoring plan should be a requirement of the terms and conditions of the EA certificate and should include TKN involvement in reviewing and implementing the plan. Bell, A., Collins, N, and Young, R. Practitioner's Guide to Incorporating Climate Change into the Environmental Impact Assessment Process. Final Draft. 2003. ClimAdapt: Nova Scotia's Climate CHange Adaptation Initiative.	A conceptual Wildlife Management and Monitoring Plan is presented in the EAC Application (Section 24.19) and will be further developed in the permitting process for phase of the Project. It is anticipated that TKN will participate in the permit review process as a member of the Mine Review Committee to be established by the MMPO and will have an oppurtunity 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 IBA discussions.	28-Oct-16
TKN-088.2	23-Nov-16	H. Van de Vosse, EDI	Fish and Aquatic Habitat and Terrestrial Ecosystems	Acknowledged that the Wildlife Management and Monitoring Plan will be developed during permitting phase and TKN will participate in review and have an opportunity to comment on the plan(s) as a member of the MRC. A list of monitoring components for the Wildlife Monitoring and Management Plan are being developed as part of the EAC.	The Proponent acknowledges the comment and will take it into consideration during permitting.	21-Dec-16
TKN-089	26-Jun-16	S. Barnes, EDI	Terrestrial Ecosystems	One objective of the Terrestrial ecosystems and vegetation baseline report (Appendix 13-A), as summarized in the EA Application, was to "map and characterize ecosystems in the LSA surrounding the Project, including ecosystems tracked by the BC CDC as Red or Blue-listed Ecosystems." However, in the baseline report Section 2.4.2.1 the authors note that within the BAFAun "few of the ecosystems had previously been described..." meaning that the new ecosystem descriptions developed specifically for the KUG EA (following the techniques outlined in Luttermerding et al [1990] from EA Section 13.4.2.2) will not be tracked or listed by the BC CDC. Please provide information on how newly described ecosystems were determined to be common or secure in the absence of status (Red- or Blue-list) information from the BC CDC.	The alpine ecosystems were correlated to the alpine classes outlined in MacKenzie (2012). This is the classification system used in the province to map alpine ecosystems. Listed ecosystems in BC are most commonly those affected by development or logging history. In general, historic disturbance to alpine ecosystems is uncommon and therefore they are less likely to occur. Of the 65 alpine ecosystem types identified in the BC Conservation Data Centre lists, only five have listed status. None of the listed types occurs in the Mackenzie Forest District, in which the Project is located. Mackenzie, W.H. 2012. Biogeoclimatic Ecosystem Classification of Non-forested ecosystems in British Columbia. Technical Report 068. Ministry of Forests, Lands and Natural Resource Operations: Victoria, BC.	5-Aug-16
TKN-090	26-Jun-16	S. Barnes, EDI	Terrestrial Ecosystems	It is not clear how Ecological Communities of Interest were assessed and whether potential project effects to these communities were assessed as if these communities were Red- or Blue-listed given that they are "locally atypical and... may be particularly sensitive to even minor levels of disturbance." Please provide further detail on the treatment and effects assessment of Ecological Communities of Interest.	The locations of ecological communities of interest are shown in Figure 5.4-4 of Appendix 13-A. Two ecological communities of interest occur within the areas anticipated to be altered shown in Figure 13.5-2; the Attichika Creek floodplain and the Botrychium meadow. However, the location of the blue-listed species, Botrychium ascendens, is outside of the area that will be altered (Figure 5.4-2 of Appendix 13-A). The portion of waterline that will be placed below the existing road and within the Attichika Creek floodplain may alter up to 5.2 ha of the Sw-Shrubby cinquefoil-Horsetail (SH) forested ecosystem and 2.3 ha of the Willow-Sedge Fen (WF) wetland (Table 13.5-6). Willow-sedge fen is the most common wetland type in the LSA with 464 ha available (Table 13.4-5) and there is ~900 ha of Sw-Shrubby cinquefoil-Horsetail (SH) forested ecosystem within the LSA (Table 2.4-4 of Appendix 13-A). Therefore, effects to ecological communities of interest will be minimal.	5-Aug-16
TKN-091	26-Jun-16	S. Barnes, EDI	Terrestrial Ecosystems	It is assumed that harvestable plants are meant to encompass plants of traditional and cultural importance to the TKN. There is no reference to the TLUS completed by the TKN (Crossroads 2015) and provided to the proponent in the list of literature related to harvestable plants. Please explain if and how the information from the TLUS was incorporated into the effects assessment for Harvestable Plants.	The assessment used five separate literature sources to compile a list of harvestable plants in the Project Vicinity. There were 67 potential harvestable plants identified in the LSA (Chapter 13; Table 13.4-6). Of the 37 species mentioned in the TLUS completed by the TKN (Crossroads 2015), 29 were included in the potential plant species within the LSA (Chapter 13; Table 13.4-6).	5-Aug-16
TKN-092	26-Jun-16	S. Barnes, EDI	Terrestrial Ecosystems	The Sb-Horsetail-Sphagnum ecosystem (SO/Wb09) is listed under the Forested VC rather than the Wetland VC even though SO is treated as a wetland in the baseline report and included in EA Table 13.4-5 Wetland Type and Distribution within the LSA. Have forested wetlands been treated and assessed in the EA under the Forested or Wetland VC?	The Sb-Horsetail-Sphagnum ecosystem (SO/Wb09) is considered transitional to upland forest and included in both wetland and upland categories in classification systems. The Sb-Horsetail-Sphagnum ecosystem (SO/Wb09) was also assessed as a blue-listed wetland in the Application (it is now yellow-listed by the CDC). These ensured effects to this ecosystem were assessed in the application.	5-Aug-16
TKN-093	26-Jun-16	S. Barnes, EDI	Terrestrial Ecosystems	The areas for certain ecosystems in Table 13.4-4 do not match what is described in Table 3.4-1 of the baseline report. For example, but not limited to: SO baseline = 253.1 ha, EA = 252.2 ha; WB baseline = 315.6 ha, EA = 321.5 ha. Were mapping updates or additional area calculations undertaken after the completion of the baseline report?	Additional mapping was completed after the baseline was completed to address potential KUG TSF discharge pipeline routing options. This additional mapping is identified in Table 13.4-1. The reference for this is included in the reference section: ERM. 2015a. Kemess Underground Project: 2014 Thutade Lake Discharge Option Terrestrial Ecology and Rare Plant Baseline. Prepared for AuRico Gold Inc. by ERM Consultants Canada Ltd: Vancouver, BC.	5-Aug-16
TKN-094	26-Jun-16	S. Barnes, EDI	Terrestrial Ecosystems	A review of the BC CDC's 2016 changes (available at http://www.env.gov.bc.ca/atrisk/changes.htm) indicates that at some point after June 2015 the status of the Wb09 (SO) ecosystem in the SWBmk was changed from Blue-listed to Yellow-listed. From the Baseline Report (Section 5.2.2.1), the BC CDC was queried in 2014 to identify rare ecosystems. Have the current BC List statuses for all ecosystems mapped in the LSA been checked since 2014 to ensure a mapped ecosystem previously on the Yellow-list was not added to the Blue- or Red-list prior to completing the effects assessment for listed communities?	The BC CDC was searched (July 2016) for changes to the listed plant communities that might affect the assessment of listed communities completed. The only change that affects ecosystems mapped in the TEM was the change of Wb09 from blue-listed to yellow-listed. This change does not alter the assessment of residual effects or conclusions presented in the Application.	5-Aug-16
TKN-095	26-Jun-16	S. Barnes, EDI	Terrestrial Ecosystems	Blue-listed communities were screened out of the "effects assessment because Project components and activities are not expected to interact with any of the Blue-listed ecosystems..." As requested above, have the current BC List statuses for all ecosystems mapped in the LSA been checked since 2014 to ensure a mapped ecosystem previously on the Yellow-list was not added to the Blue- or Red-list prior screening out listed communities from the effects assessment?	The BC CDC was searched (July 2016) for changes to the listed plant communities that might affect the assessment of listed communities completed. The only change that affects ecosystems mapped in the TEM was the change of Wb09 from blue-listed to yellow-listed. This change does not alter the assessment of residual effects or conclusions presented in the Application.	5-Aug-16
TKN-096	26-Jun-16	S. Barnes, EDI	Terrestrial Ecosystems	The key project effects identified for wetland ecosystems include Subsidence, Access Corridor and Portal Area. However, from Figure 2.4-2 in the Baseline Report and Table 13.5-6 in the EA, the Attichika Creek - Waterline will require construction within areas mapped in the TEM as containing wetland ecosystems (e.g., WF [Wf04] and WB [Ws04]). Why was the Attichika Creek Waterline not included under effects identified for wetland ecosystems in addition to the subsection found later in the document?	Additional text in 13.5.3.3 could have been added specific to wetland crossed by the KUG TSF discharge water line as this was considered in the assessment and identified an area of wetland alteration. The discharge line was included in the screening of key effects. Figure 13.5-2 shows the location of the Attichika Discharge line; and in Table 13.5-1, it is referred to under dewatering of the KUG TSF in the Project phases. It was assessed separately as only alteration was anticipated, as the pipeline will be located primarily along the edge of the existing road and laid on the ground and surface of the fen. A large buffer was used to assess the potential alteration; the actual alteration caused by the pipeline will be less.	5-Aug-16
TKN-096.1	10-Oct-16	S. Barnes, EDI	Terrestrial Ecosystems	Acknowledged that project design avoided much of the wetlands, however, this should have been clearer in the Application and because construction of the waterline will be in the wetland, it should be considered habitat loss and not alteration. Because works will occur in the wetlands, a detailed mitigation and management plan should be developed for areas where wetlands will be affected. (i.e. Along the water discharge line). This plan should include monitoring during and post-construction to ensure reasonable effort is made to reduce impacts to the wetland from the waterline and that BMPs are followed as best as practical. This monitoring plan should be a requirement of the terms and conditions of the EA certificate and should include TKN involvement in reviewing and implementing the plan.	Environmental protection measures relevant to construction activties are included in the conceptual Ecosystem Management Plan included in the Application (see Section 24.4.4 of the Application). The Ecosystem Management Plan will be developed in further detail to support the permitting process including additional and more detailed measures specific to mitigating adverse effects to wetlands from construciton construction activities as well as monitoring requirements.It is anticipated that TKN will participate in the permit review process as a member of the Mine Review Committee to be established by the MMPO and will have an oppurtunity 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 IBA discussions.	28-Oct-16

Kemess Underground Application Review - TKN Issues Tracking Table - January 6, 2017

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ID #	**Comment Date**	**Reviewer Name / Agency (i.e. Alex Kwang, MEM)**	**Subject (See "instructions" tab)**	**Comment (Include Memo reference as applicable)**	**Proponent Response (Include Memo reference as applicable)**	**Response Date**
TKN-096.2	23-Nov-16	S. Barnes, (S. Elwell) EDI	Terrestrial Ecosystems	An Ecosystem Management Plan should be a comittment in the EA Certificate. Language in the EAC should identify that this plan will include measures specific to mitigate adverse effects to wetlands from construction activities and that plan details will be developed with participation from TKN as part of the Mine Review Committee during the Mines Act permitting process.	AuRico acknowledges further discussion on the comment is deferred to permitting.	21-Dec-16
TKN-097	26-Jun-16	S. Barnes, EDI	Terrestrial Ecosystems	This subsection and associated table (Table 13.5-6) indicate that there will be alteration to a number of ecosystems intersected by the waterline. However, there is no quantified ecosystem loss to account for the location of the physical waterline and access road. Please provide the Loss Area in addition to the Alteration Area for each ecosystem.	The discharge infrastructure will consist of two 0.5 m diameter pipes. The pipeline will follow an existing access road edge for 2,100 m and 620 m runs through undisturbed ecosystems. The length of pipeline through the undisturbed portion will have require a narrow maintenance trail. Assuming a 5 m wide footprint to include the pipeline and maintenance trail, the total loss through the undisturbed ecosystems would be 0.3 ha. This was considered negligible in terms of loss and thus not reported; the 100 m wide buffer used for assessing alteration is an overestimate of potential effects to ecosystems.	5-Aug-16
TKN-097.1	10-Oct-16	S. Barnes, EDI	Terrestrial Ecosystems	Please refer to 2nd round comment related to TKN-096 (i.e. TKN -096.1)	Please refer to response provided to TKN-096.1	28-Oct-16
TKN-098	26-Jun-16	S. Barnes, EDI	Terrestrial Ecosystems	One Minimization Measure proposed to minimize potential effects to wetland ecosystems is the application of BMPs for road construction. Please reference which BMP document is being cited and clarify how and if waterline construction/operation is effectively mitigated using road construction BMPs.	BMPs used for the roads and construction of the discharge line will include those identified in the Forest Practices Code Riparian Management Area Guidebook (BC MOE and BC MOF 1995). These include detailed guidance on the location of roads, harvesting methods, and wetland buffers to reduce effects on riparian areas, including wetlands. Other best management practices (BMPs) for the mining industry include the following key management practices for protecting wetlands in BC (Cox and Cullington 2009): • controlling leaching and sedimentation; • ensuring dewatering production processes do not affect wetland hydrology; • re-vegetating using pre-development area species; • use of low impact re-vegetation techniques; • re-establishing wetland functions; and • monitoring of enhancement, restoration, and creation activities to ensure success. The BMPs also emphasize caution around planning, construction, and use of trails and roads because they can: • be a major source of sediment; • cause habitat loss and/or fragmentation through infilling or dewatering; • enable exotic invasive species (for the purposes of the assessment the term invasive species includes only exotic invasive species) colonization; and • increase recreational impacts(Cox and Cullington 2009). Cox, R. and J. Cullington. 2009. Wetland Ways: Interim Guidelines for Wetland Protection and Conservation in British Columbia. Wetland Stewardship Partnership: n.p. BC MOE and BC MOF. 1995. Forest Practices Code Riparian Management Area Guidebook. Forest Practices Code of British Columbia Act. Government of British Columbia: n.p.	5-Aug-16
TKN-099	26-Jun-16	S. Barnes, EDI	Terrestrial Ecosystems	The Residual Project Effects Assessment indicates that "proposed management and mitigation measures are considered adequate to avoid residual effects to wetlands..." Please clarify how the loss of wetland ecosystems due to Project construction (e.g., Attichika Waterline) and the application of road construction BMPs are sufficient to determine no residual effects to wetland ecosystems. Is this determination based on the relatively small area anticipated to be affected by the Project or based on wetland function?	Residual effects to wetland were considered negligible because of limited area expected to be either lost or altered and application mitigation measures. In addition to mitigation measures, Project design considered the location of wetlands and used avoidance to minimize Project effects to wetlands (the route for the Discharge Line for example was re-designed to avoid most wetlands). The loss of wetlands and affects to wetland function due to the Project were considered not residual because of the very small area of loss (0.3 ha) and limited alteration of wetland functions.	5-Aug-16
TKN-099.1	10-Oct-16	S. Barnes, EDI	Terrestrial Ecosystems	Please refer to 2nd round comment related to TKN-096 (i.e. TKN -096.1)	Please refer to response provided to TKN-096.1	28-Oct-16
TKN-099.2	23-Nov-16	S. Barnes, (S. Elwell) EDI	Terrestrial Ecosystems	The Proponent response is acknowledged and anticipated TKN participation in the permit review process and development and implementation of the Ecosystem Management Plan and associated monitoring is also acknowledged.	AuRico acknowledges further discussion on the comment is deferred to permitting.	21-Dec-16
TKN-100	26-Jun-16	S. Barnes, EDI	Terrestrial Ecosystems	The table of cumulative interactions between KUG and other projects and activities includes Sustut Copper and Aley Niobium as reasonably forseeable future projects. However, no cumulative interaction is expected with either project for either VC (Alpine/Parkland and Forested Ecosystems). On what basis was this determination made? Will Sustut and Aley not result in any tree clearing or effects to alpine/parkland ecosystems? This determination seems unlikely.	The Sustut Copper and Aley Niobium Projects do not occur in the RSA, which was the spatial boundary within which cumulative effects were assessed.	5-Aug-16
TKN-101	26-Jun-16	S. Barnes, EDI	Terrestrial Ecosystems	The Sustut Copper Project is included in Table 13.7-1 but not in Table 13.7-2. Was Sustut Copper included in the CEA considering Selkirk Minerals withdrew from the EA process in March 2016?	The Sustut Copper and Aley Niobium Projects do not occur in the RSA, which was the spatial boundary within which cumulative effects were assessed. The Aley Niobium Project should also have been excluded from Table 13.7-2.	5-Aug-16
TKN-102	26-Jun-16	S. Barnes, EDI	Terrestrial Ecosystems	What mitigation measures will be implemented in locations where it is not possible to "ensure setback and buffer distances from surface water bodies, riparian features and wetlands are implemented and maintained"? For example, the Attichika Waterline which will cross wetland ecosystems.	Impacts to terrestrial and wetland ecosystems that depend on hydrological connectivity and flow will be minimized through best management procedures for road construction. The pipeline will be located primarily along the edge of the existing road and laid on the ground and surface of the fen. Exposed soil surfaces will 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.	5-Aug-16
TKN-102.1	10-Oct-16	S. Barnes, EDI	Terrestrial Ecosystems	Please refer to 2nd round comment related to TKN-096 (i.e. TKN -096.1)	Please refer to response provided to TKN-096.1	28-Oct-16
TKN-102.2	23-Nov-16	S. Barnes, (S. Elwell) EDI	Terrestrial Ecosystems	The Proponent response is acknowledged and anticipated TKN participation in the permit review process and development and implementation of monitoring and management plans is also acknowledged.	AuRico acknowledges further discussion on the comment is deferred to permitting.	21-Dec-16
TKN-103	26-Jun-16	D. Bean, EDI	Fish and Aquatic Habitat	The BC Water Sustainability Act has superseded the Water Act. The WSA may have requirements to consider instream flow for fish given that there are changes to streamflow levels predicted. Has the proponent reviewed the WSA to determine any requirements applicable to the Project?	The projected changes in streamflows in Project streams are within the range of error in hydrological measurements in all fish streams except WRC. It would not be feasible to realistically detect changes in fish populations with such small alterations of discharge in Attichika and Attycelley creeks. WRC is confounded by past South Kemess activities that have lead to conditions, some flow-related, that have resulted in the current fish populations in WRC. While the WSA does not outline a threshold flow that would intiate instream flow studies, it does indicate that the regulator must consider the instream flow needs of an applicable stream. It is not clear that the small remaining section of WRC (~250 m) that has not been part of the Compensation Program at Kemess South would be considered a candidate stream for KUG instream flow studies. However, some instream flow studies were conducted on WRC as part of the Kemess South Project. The results of these studies may be used to meet applicable WSA requirements.	5-Aug-16
TKN-104	26-Jun-16	D. Bean, EDI	Fish and Aquatic Habitat	Add Hazardous Waste Regulation	Comment acknowledged.	5-Aug-16
TKN-105	26-Jun-16	D. Bean, EDI	Fish and Aquatic Habitat	The RSA in Figure 14.3.1 does not match that in Figure 1.6-1. Assume that the map in Ch. 14 is correct - RSA includes Thutade Lake.	The RSA includes Thutade Lake and the upper Finlay River as shown in Figure 14.3.1.	5-Aug-16
TKN-106	26-Jun-16	D. Bean, EDI	Fish and Aquatic Habitat	Substrate composition (size class distribution) should be included as an indicator under the Sediment Quality VC and in table 14.3-3. We note that it has been considered in the effects assessment.	Comment acknowledged.	5-Aug-16
TKN-107	26-Jun-16	D. Bean, EDI	Fish and Aquatic Habitat	Table 14.6-14 - States that there is a High confidence in the non-significance of residual effects. Having a high confidence is not justified in this reviewers opinion. Surface water quantity and quality predictions are derived from models with inherrent uncertainty based on infrastructure plans that are subject to final design changes and un-proven water treatment technology for selenium removal.	The Fish and Aquatic Residual Effects Assessment relied on input from the Surface Hydrology (Chapter 10) and Water Quality (Chapter 11) components of the study. The Surface Water Quantity Assessment concluded there was High Confidence in the Residual Affects Assessment (Table 10.6.8). The authors indicate the input data used in the predictive water balance model were high quality, and the range of existing and projected variability in both the existing regime and the mine-influenced regime were well-constrained by the many model realizations that have been run. Therefore, the confidence that the predicted changes in the existing stream flow regime will take place was considered high, as was the confidence that the actual changes would fall within the range of modelled results. Given the above, there was high confidence in the conclusions of the assessment (Section 10.6.1.2). Similarly the Water Quality Assessment indicated a High Confidence in the Residual Effects Assessment (Table 11.6-14) and the authors indicate confidence in the high quality of the data input and the modelling results (Section 11.6.2.6).	5-Aug-16
TKN-107.1	10-Oct-16	D. Bean, EDI	Fish and Aquatic Habitat	While we disagree that high confidence is justified, when all issues raised by SEA regarding the water quality and quantity assessments are resolved to TKN's satisfaction we will consider this issue also resolved.	AuRico acknowledges the comment.	4-Nov-16
TKN-108	26-Jun-16	D. Bean, EDI	Fish and Aquatic Habitat	An aquatic environmental effects monitoring program will be developed at a later date through effluent permitting processes, either under the federal Metal Mining Effluent Regulations or provincial Environmental Management Act. TKN should be provided the opportunity to review the detailed Fish and Aquatic Habitat Monitoring Plan developed during permitting. Important aspects that should be reviewed in the final monitoring plan include: evaluation of suitability of control sample sites, ensuring that fish health metrics and observations have been included in the fish monitoring components, ensure that biological sampling continues during the closure phase, ensure that turbidity/TSS is monitored as part of the water quality monitoring program, ensure that a binding commitment to swift adaptive management is made to address unexpected effects.	AuRico continues its ongoing communication with TKN leadership regarding TKN participation in site monitoring during operations & closure. TKN members will be employed directly by AuRico for monitoring and reporting activities. TKN members will be members of the Environmental Management Committee that is expected to participate in development of EMPs (i.e. included as part of IBA).	5-Aug-16
TKN-108.1	10-Oct-16	D. Bean, EDI	Fish and Aquatic Habitat	Response noted. Future monitoring or management plans related to fish and aquatic habitat should be reviewed based on: evaluation of suitability of control sample sites, ensuring that fish health metrics and observations have been included in the fish monitoring components, ensure that biological sampling continues during the closure phase, ensure that turbidity/TSS is monitored as part of the water quality monitoring program, ensure that a binding commitment to swift adaptive management is made to address unexpected effects. This monitoring plan should be a requirement of the terms and conditions of the EA certificate and should include TKN involvement in reviewing and implementing the plan.	Monitoring components and duration of monitoring will be finalized during the Project permitting phase. AuRico acknowledges further discussion on the comment is deferred to permitting when the Fish and Aquatic Effects Monitoring Plan will be developed in full.	28-Oct-16
TKN-108.2	23-Nov-16	D. Bean, EDI	Fish and Aquatic Habitat	The concern has been addressed with a commitment to further discussions with TKN during the permitting phase when the Fish and Aquatic Effects Monitoring Plan will be developed.	AuRico acknowledges further discussion on the comment is deferred to permitting.	21-Dec-16
TKN-109	26-Jun-16	D. Bean, EDI	Fish and Aquatic Habitat	Fish health is not included in the list of indicators despite being in table 14.3-3. Also not represented in list of interaction pathways or discussed in the effects assessment. Fish health was documented as being an indicator (i.e. a project effect) that would be assessed as documented in the Application for Information Requirements (AIR) Why has it not been considered an indicator in the effects assessment? Please assess Project effects on fish health as identified in th AIR.	As presented in Table 14.5.1 and discussed on page 14.79, fish health is affected by changes in sediment and water quality. Effects on fish health will be monitored indirectly through monitoring and mitigating project related effects on sediment (primarily sedimentation and erosion potential effects, Section 14.5.2.2) and water quality (Section 14.5.2.4). Fish health is currently monitored directly (i.e., monitoring of fish condition factor) as part of the EEM program for WRC and would be expanded as the Project progressess, as outlined in Chapter 24.	5-Aug-16

Kemess Underground Application Review - TKN Issues Tracking Table - January 6, 2017

	For Working Group Use				For Proponent Use	
ID #	**Comment Date**	**Reviewer Name / Agency (i.e. Alex Kwang, MEM)**	**Subject (See "instructions" tab)**	**Comment (Include Memo reference as applicable)**	**Proponent Response (Include Memo reference as applicable)**	**Response Date**
TKN-109.2	10-Oct-16	D. Bean, EDI	Fish and Aquatic Habitat	Fish health remains under-represented in the effects assessment. Specific predictions of potential and residual effects should be included in Sections 14.5 and 14.6 given that fish health is one of only three indicators for fish VCs. Please provide additional information pertaining to project effects on fish health in the effects assessment.	Given no predicted direct effects on fish habitat, and with implementation of mitigation plans to minimize sedimentation effects and install a diffuser to rapidly mix discharged effluent into receiving waters of Attichika Creek, any residual effects of the project on fish health would be expected to occur via changes in water quality in lower Attichika Creek downstream of the proposed mine discharge. Additional mitigation of water quality effects through effluent treatment to reduce metals concentrations will result in water quality that meets BC guidelines for the protection of aquatic life in lower Attichika Creek (see Application, as well as the July 2016 updated effects assessment for the Feasibility Study Update, and various other comment responses from AuRico to MOE and TKN). Therefore, no water-quality-mediated effects on fish health are expected from the Project. This predicted absence of effects will be confirmed by aquatic monitoring programs reqiured by the Province (i.e., Aquatic Effects Monitoring Program to be developed under the joint MEM/MOE Permit) and federal Environmental Effects Monitoring (EEM). If any effects on fish health are identified through these prescriptive programs, the mine will be obligated to investigate the causes of such effects and identify solutions to any mine-related effects.	28-Oct-16
TKN-109.2	23-Nov-16	D. Bean, EDI	Fish and Aquatic Habitat	The concern has been addressed with the condition on implementation of monitoring program and that TKN is included in discussions of the final design of the diffuser and the size of the IDZ.	AuRico acknowledges further discussion on the comment is deferred to permitting.	21-Dec-16
TKN-110	26-Jun-16	D. Bean, EDI	Fish and Aquatic Habitat	Table 14.5-1 - Environmental monitoring during construction, operation, and closure may include planned lethal sampling of fish for tissue metals concentration analysis. These activities should be shown to have expected adverse effects on fish.	It is acknowledged that there is potential for a possible interaction associated with an expanded fish monitoring program that includes some lethal sampling of Dolly Varden, rainbow trout and bull trout for fish health including background metals. However, it should be noted that an ongoing monitoring program is presently in place on Waste Rock Creek and lower Attichika Creek and the adult bull trout program uses sublethal sampling methods.	5-Aug-16
TKN-111	26-Jun-16	D. Bean, EDI	Fish and Aquatic Habitat	The EA is missing detailed mapping of the relationships between the project footprint (including any areas of temporary disturbance during construction) and aquatic and riparian vegetation. Detailed maps of the following are requested: the main portal in the headwaters of El Condor Creek, and the KUG-TSF discharge pipe across the wetland and riparian habitat to Attichika Creek including road access.	See Appendix 14-C, Figure 2.3.1, Chapter 13, Figure 13.5-2, and appendix 13A for the detailed mapping requested.	5-Aug-16
TKN-111.1	10-Oct-16	D. Bean, EDI	Fish and Aquatic Habitat	Fig. 2.3.1 in Appendix 14-C shows no project infrastructure, Fig. 13.5-2 in CH. 13 is not a suitable scale to review footprint impacts, Fig. 2.4-2 in Appendix 13A is acceptable. No further action is required.	AuRico acknowledges the comment.	4-Nov-16
TKN-112	26-Jun-16	D. Bean, EDI	Fish and Aquatic Habitat	Table 14.5-2 - Though relatively small, there will be some riparian clearing and aquatic habitat disturbance in Attichika Creek, and this residual effect should be carried forward. Proponent indicates that there will be no long term disturbance and therefore no residual effect and no compensation but, as discussed 14.5.3.5, the specifics of the design are not yet available but may include "larger rock material to protect the integrity of the pipe". This should be considered a residual effect and brought forward to assess significance.	Construction of the KUG TSF discharge pipe will follow all applicable permit requirements for conducting works within a stream. Any riparian clearing and aquatic habitat disturbance associated with instream works will be minimal and of short duration (i.e., once works are complete, restoration/replanting of the disturbed areas will be conducted). With respect to the possible use of "larger rock material to protect the integrity of the pipe", this will be designed in a way that provides additional cover habitat and habitat heterogeneity to the crossing area, while maintaining adequate water passage during peak flows. The small effect resulting from clearing the riparian section at the entrance of the pipeline to Attichika Creek and the road structure across the floodplain is minor and we suggest is dealt with through mitigation measures. At the design stage, all efforts will be made to keep the pipeline access corridor at least 30 m back from the active streambanks of the Attichika Creek except at the point of entry to the creek where disturbance would be kept to a minimum needed to do the project.	5-Aug-16
TKN-112.1	10-Oct-16	D. Bean, EDI	Fish and Aquatic Habitat	We maintain that these small effects should be carried forward, but no further action is required.	AuRico acknowledges the comment.	4-Nov-16
TKN-113	26-Jun-16	D. Bean, EDI	Fish and Aquatic Habitat	Table 14.5-2 - This section should include a discussion of the potential loss of habitat due to changes in surface hydrology.	Table 14.5.2 (Proposed Mitigation) should include: "Assess Changes in Water Quantity, and Fish and Aquatic Effects Monitoring Plan (Section 24.7)". It should be noted that a potential reduction of fish habitat in the lower 250 m section of lower Waste Rock Creek will not affect the residual effects assessment for KUG that changes in WRC fish populations are not signifcant at the Project level, and are largely attributed to factors associated with Kemess South.	5-Aug-16
TKN-114	26-Jun-16	D. Bean, EDI	Fish and Aquatic Habitat	Table 14.5-2 - I question the stated "High" effectiveness of erosion and sediment control mitigation measures leading to a determination of no possible residual effect. While erosion and sediment control measures are known to be effective, they are not likely to prevent all sediment from the many potential sources listed in 14.5.2.2 from entering water courses. While the residual effect may not be deemed significant, it should have be brought forward to the effects assessment as some project-related sediment delivery to waterbodies is highly likely during all project phases.	With the implementation of erosion and sediment control measures (as outlined in Chapter 24), there is generally minimal risk of effects from erosion and sedimentation to fish and aquatic habitat due to the limited extent of planned surface disturbances for the Project and the proposed use of pre-existing infrastructure. However, it is acknowledged that even with the application of identified best management practices, these strategies may not fully prevent all surface runoff and sediment entry. Residual effects to surface water quality due to sedimentation and erosion are assessed in Section 11.6.3, and residual effects were assessed as not sigificant.	5-Aug-16
TKN-114.1	10-Oct-16	D. Bean, EDI	Fish and Aquatic Habitat	We maintain that stating high confidence is not justified but no further action is required.	AuRico acknowledges the comment.	4-Nov-16
TKN-115	26-Jun-16	D. Bean, EDI	Fish and Aquatic Habitat	This section indicates that instream work is to be completed after freeze-up. However, provincial guidelines for Region 7 indicate that July 15th to August 15th is the preferred instream work window. The EA should acknowledge that what is being proposed is not in keeping with BMPs and provide a more thorough rationale for the exception.	The Omineca and Peace instream work window for bull trout systems is June 15 to August 15. We suggest that the early winter might be a more suitable timing window for instream work for installing and removing the diffuser pipe. This is recommended for the following reasons: 1) There is limited bull trout spawning located downstream from the difuser location; 2) The timing would overlap bull trout migration past this site from July through mid-August; and 3) The June period is a period of high flow in the lower Attichika that would make working conditions more difficult. We also suggest that the wetter ground on the Attichika flood plain would be easier to work in after freeze-up. Information gathered during the fall surveys after bull trout spawning is completed would be used to determine whether any bull trout had spawned in the vicinity of the proposed discharge pipe location. Details in terms of timing and methods would be provided at the time of permitting.	5-Aug-16
TKN-116	26-Jun-16	D. Bean, EDI	Fish and Aquatic Habitat	Statement that increased flows necessarily improve habitat conditions for Dolly Varden in Waste Rock Creek is not supported. Habitat suitability indices for Dolly Varden indicate a preference for moderate depths and low velocities. It would be necessary to know how the hydraulic habitat would change with flow increases to make predictions about the associated change in habitat quality and quantity. Increases in freshet flood flows (90th percentile spring months) by 183% in closure and 313% in post-closure more than likely constitute decreases in habitat quality for juvenile rearing in these phases. Proponent indicates that this is closer to pre KS state but has not modeled or quantified natural flow conditions. See Table 14.6-6 in the Application. References: AMEC. 2011. Habitat Suitability Index (HSI) Model for Dolly Varden, APPENDIX 6.7-G of the Kitsault Mine Project Environmental Assessment. Consultant's report for Avanti Mining Inc. EMA (Environmental Management Associates). 1994. Bull trout juvenile and spawning habitat preference criteria, Smith-Dorrien Creek, Alberta. Consultant's report for Alberta Environmental Protection, Edmonton, AB. 18pages + App.	It is acknowledged that in the lower 250 m section of Waste Rock Creek, Dolly Varden fry rearing habitat during the freshet and summer rearing period may be reduced with the higher flows projected with KUG compared to without the project. However, the predicted flow increases are anticipated to be consistent with pre-KS natural flow conditions, which is discussed more fully in the response to TKN-118.	5-Aug-16
TKN-116.1	10-Oct-16	D. Bean, EDI	Fish and Aquatic Habitat	It has been acknowledged that Dolly Varden fry rearing habitat during the freshet and summer rearing period may be reduced with the higher flows projected with KUG compared to without the project.However the small extent of this change 250 m results in the non-significant residual effect. No further action required.	AuRico acknowledges the comment.	4-Nov-16
TKN-117	26-Jun-16	D. Bean, EDI	Fish and Aquatic Habitat	Indication of high confidence in assessment of hydrological change impacts to Waste Rock Creek fisheries is not justified. Hydrological modeling has inherrent uncertainty despite the quality of the input data. The relationship between flow and habitat quality is also complex and all of this is based on conceptual project design and engineering.	It is acknowledged that hydrologic models are inherently uncertain. A high confidence level was assigned to the water balance model based on the available baseline hydrometric data with satisfactory temporal and spatial coverage, as well as strong match between the modelled and measured flows during the calibration and verification process (Section 2.3.3 in Appendix 11-D). It is recognized that uncertainty is inherent in both the measurement and modelling of streamflow regimes associated with the pre- and post-development conditions at a proposed mine. However, as outlined in Appendix 10-A (Baseline Hydrology Report), and the subsequent memos provided in response to MOE review comments (Lorax 2016a, 2016b), the quality of the baseline hydro-climatic data collected at the Project site is of high-quality and spans a representative series of dry- and wet-years. The water balance model is driven by a robust, regionally representative synthetic climate dataset that correlates very well with both the measured site climate and runoff data, with monthly R2 values of 0.62 to 0.72 for the precipitation: streamflow relationship over the 30+ year dataset. The water balance model has been calibrated to a high-quality long-term synthetic streamflow dataset, that has Nash-Sutcliffe efficiency metrics (when compared to the measured data) of 0.82 to 0.92 (a value of 1.0 is a perfect match between datasets). Further screening (in addition to that provided in Appendix 10-C) of the water balance model outputs was provided in a technical memo generated in response to an MOE review comment (Lorax 2016c). We agree that there is uncertainty in the relationship between Dolly Varden habitat and the projected flow regime. The relationships are complex and assumptions are made that add uncertainty. This uncertainty is typical of many instream flow versus fish habitat assessments that are based on local information and the in-channel flow measurements are extensive but do not always cover the full range of flows encountered. It should be noted that the flow and habitat quality assessment is restricted to the lower 250 m long section of Waste Rock Creek. Many factors beyond availability of suitable fish habitat affect fish use in lower WRC as outlined in Chapter 14 Section 14.6.1.1. Any changes that influence the very small population of fish in the remaining section of lower WRC do not affect the conclusion that there will be no significant residual project effects on fish and aquatic habitat with the projected changes in streamflow in WRC associated with KUG.	5-Aug-16
TKN-117.1	10-Oct-16	D. Bean, EDI	Fish and Aquatic Habitat	We maintain that stating high confidence is not justified but no further action is required.	The comment is acknowledged.	28-Oct-16
TKN-118	26-Jun-16	D. Bean, EDI	Fish and Aquatic Habitat	Statement that increased flows in Waste Rock Creek during closure and post-closure will be more similar to pre-KS conditions could have been quantified if modeling of pre-KS conditions was completed.	Response is provided in memo **20160805 A.1 KUG Comments TKN-048, 049, 050, 118_.WQ_Memo**	5-Aug-16
TKN-118.1	10-Oct-16	D. Bean, EDI	Fish and Aquatic Habitat	The thorough response in the memo is appreciated.		4-Nov-16
TKN-119	26-Jun-16	D. Bean, EDI	Fish and Aquatic Habitat	The list of monitoring program performance objectives are, in fact, monitoring variables and reporting commitments. Performance objectives should be: 1. Maintenance of all water quality parameters within guideline thresholds, 2. Maintenance of fish populations within the range of natural variation, 3. Maintenance of fish health parameters within the range of natural variation, 4. Maintenance of aquatic primary production within the range of natural variation, 5. maintenance of the community composition and productivity of aquatic macroinvertebrates within the range of natural variation, and 6. maintenance of substrate composition and contaminant load within the range of natural variation.	The Fish and Aquatic Effects Monitoring Plan is a monitoring plan that will be fully developed during the permitting process. The performance objectives identified by the reviewer are captured in the Surface Water Management Plan and the Water Treatment Plan.	5-Aug-16
TKN-120	26-Jun-16	D. Bean, EDI	Fish and Aquatic Habitat	Only considers KUG TSF flow to Attichika Creek as a mine discharge but in closure and post-closure this flows to Waste Rock Creek which should also be included.	Flows to Waste Rock Creek during Closure and Post-Closure will be monitored in accordance with the MMER and Permit conditions	5-Aug-16
TKN-121	26-Jun-16	D. Bean, EDI	Fish and Aquatic Habitat	The tables characterizing effects should include the direction of change (adverse/positive). For example, for increased flow effects in Waste Rock Creek the effect is characterized as high magnitude, continuous and irreversible, which would make it a significant effect if the prediction were not for positive change.	The Application follows guidance provided in the Guideline for Selection of Valued Components and Assessment of Potential Effects (BC EAO, 2013). According to this guideline, the assessment is intended to address residual adverse effects, thus direction (i.e. positive/adverse) is not a standard characterization of residual effects. Note that in addition to expected benefits that increased flow would have in Waste Rock Creek on the aquatic community, geographical extent (local) also contributes to a not-significant determination of the effect.	5-Aug-16
TKN-122	26-Jun-16	J. Prive, EDI	Cumulative Effects Assessment	The strength of the argument for the exclusion of the Sustut Copper Project as a reasonably foreseable project seems poor given the source of the information is from 2003. No mention is made of trying to obtain more current information. The reviewer understands that Selkirk Minerals withdrew from the EA process in March 2016, however, this rationale for exclusion for Sustut Copper Project is not provided in the Application.	The Application relied on the best available sources of information at the time of the completion. The formal withdrawal of Sustut from the EA process was did not occur until following the publication of the Application for screening review. Section 8.7.1.3 of the Application refers to the 2003 Feasibility Study and states that there was no activity on Sustut Copper Project since then because of a general decline in metal prices decline. However, the Application also states that Sustut Copper Project was excluded because, regardless of the Project Description prepared in 2003, the processing of Sustut ore cannot occur while the Kemess Underground Project is operating. As previously proposed, the Sustut Project would operate if the existing Kemess mill facility was not otherwise in operation. Thus, both projects could not operate concurrently.	5-Aug-16
TKN-123	26-Jun-16	J. Prive, EDI	Wildlife and Habitat	Table 15.2-1 does not appear to be accurate nor up to date. Several cited references are obsolete (e.g. Develop with Care is a 2014 document) and other relevant references appear to be missing; e.g. -A Compendium of Wildlife Guidelines for Industrial Development Projects in the North Area, BC 2014 FLNRO -Bat Best Management Practices 2016 FLNRO -Water Sustainability Act replacement of the Water Act	A Compendium of Wildlife Guidelines for Industrial Development Project in the North Area was cited as Roberts 2014 in the document and although it is absent from Table 15.2-1 it is cited 13 times in Chapter 15. Any guidance that was published in 2016 was not referenced in the Application as it was published in January 2016 for pre-screening by the TKN prior to formal submission to the EAO for screening in March 2016.	5-Aug-16
TKN-123.1	10-Oct-16	J. Prive, EDI	Wildlife and Habitat	Develop with Care (2014) and the Bat BMP (in draft format) were both documents available to EA practioners prior to the Application submission. Regulators were actively citing their use and adoption. Regardless, no further action required.	Comment Acknowledged. Develop with Care (2014) was referenced within the Application and guidance from this document was included in the Wildlife Management and Monitoring Plan (Section 24.19). Aurico will update the management plan to support future permitting processes and will consider mitigation activities and guidance provided in the Best Management Practices for Bats in British Columbia.	4-Nov-16
TKN-124	26-Jun-16	J. Prive, EDI	Wildlife and Habitat	First paragraph page 15-20. Some concern about the baseline LSA and assessment LSA not being the same, the baseline is approx 30 ha smaller. Cannot confirm in this section what this 30 ha encompasses. Baseline conditions need to also include areas not potentially affected by the project so that potential impacts can be measureable. Please provide a comment on this.	The approximate 30 ha difference between the baseline LSA and assessment LSA were primarily on account of additional work to classify wetlands for the KUG TSF water line discharge options that were being investigated for the Project, which was conducted following the completion of baseline studies (2015). Additional Terrestrial Ecosystem Mapping (TEM) was completed within the lower floodplain of Attichika Creek, and it was this TEM that was used to complete habitat suitability modelling studies (Appendix 15-B). This 30 ha difference is 0.1% of the area of the LSA and is not expected to affect the conclusions of the affects assessment. The assessment footprint including buffers is less than 500 ha. Thus, there are substantive areas that will not be impacted by project development that were characterized for baseline conditions.	5-Aug-16

Kemess Underground Application Review - TKN Issues Tracking Table - January 6, 2017

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ID #	**Comment Date**	**Reviewer Name / Agency (i.e. Alex Kwang, MEM)**	**Subject (See "instructions" tab)**	**Comment (Include Memo reference as applicable)**	**Proponent Response (Include Memo reference as applicable)**	**Response Date**
TKN-125	26-Jun-16	J. Prive, EDI	Wildlife and Habitat	Last paragraph page 15-23. "Habitat suitability for bats was determined from the geology of the general RSA, as the habitat requirements for bats are based on geological features." As some bats are indeed driven by geological habitat, not all of the bat species found in this area are, some are more vegetation and wetland feature driven. Later in Section 15.4.2.3 (second paragraph page 15-28) VRI was also referenced as being a souce of habitat data for bats. Please ensure sections are consistent and robust data is used for all of the species of bats identified in the area.	Two different approaches were used to evaluate bat habitat; one approach was used to identify hibernating habitat (habitat suitability) and the other to identify roosting habitat (through identification of suitable ecosystems using VRI data). These two approaches were used to ensure that all habitats, including overwinter hibernating habitat and growing season roosting habitat, that may be used by bats in the Project area were identified and evaluated for Project effects. As indicated on p. 15-23, habitat suitability mapping was used to identify hibernating habitat, specifically that below ground in caves or fissures. Above ground hibernating habitat was not identified through habitat suitability mapping, as discussed on p. 15-72 "Due to harsh winter conditions in the Project area, environmental conditions are expected to preclude features above the surface (e.g. tree roosts and abandoned buildings) from sustaining hibernating bats". Roosting habitat that may be used during the growing season was identified by using VRI data to identify suitable ecosystems that have attributes (e.g., mature trees) for bat roosting. The biogeoclimatic (BEC) zones of spruce willow birch (SWB) and Boreal Altai Fescue Alpine (BAFA, formerly Alpine Tundra) biogeoclimatic zones associated with the Project LSA are cold and relatively unproductive for forests and do not support trees large enough to provide significant day or maternal roosts for bats (e.g. that may be occupied by large numbers of bats). Areas with larger trees were classified at most as moderate suitability for their potential in the LSA to support roosts for individuals, or small numbers of bats. The trees capable of providing the best day and maternal roosting habitat would be associated with more nutrient rich sites at lower elevation BEC, such as the boreal white and black spruce (BWBS) in the region.	5-Aug-16
TKN-126	26-Jun-16	J. Prive, EDI	Wildlife and Habitat	Second paragraph on page 15-27 This is a concerning paragraph it does not provide confidence in the baseline data collection. Why does the "interpretation and summarization of the raw data ....between Ardea Biological Consulting Ltd. (Ardea) and ERM" differ? Further details required or Appendix 15-A should be reworked.	The reasons for the differences are given in the same paragraph: Appendix 15-A was finalized after the Project Setting section in Chapter 15 had been written, in response to review comments from EDI; incidental observations of wildlife during other surveys were considered for sections 15.4.3, 15.4.4 and 15.4.5 whereas, reporting of baseline data results focussed on actual survey results in Appendix 15-A.	5-Aug-16
TKN-126.1	10-Oct-16	J. Prive, EDI	Wildlife and Habitat	This explanation was not clearly presented in the Application. Regardless, no further action required.	Comment acknowledged.	4-Nov-16
TKN-127	26-Jun-16	J. Prive, EDI	Other	Third paragraph page 15-53, 5th sentence should this be RSA, not LSA?	LSA is correct, though the Finlay-Ospika GBPU and WMU 3-39 are also representative of the RSA as well.	5-Aug-16
TKN-128	26-Jun-16	J. Prive, EDI	Wildlife and Habitat	Third paragraph page 15-55 This paragraph discusses the results of the capability modelling for grizzly bear. The referenced figures for spring, summer and fall living are for suitability, should be referencing Appendix 15-A Baseline (Figures 9.8-2, 9.8-3 and 9.8-4).	The comment is noted, this was an editing error that was missed during final publication.	5-Aug-16
TKN-129	26-Jun-16	J. Prive, EDI	Wildlife and Habitat	Third paragraph on page 15-56. "There was not enough information collected during baseline studies for the Project on bear use within the LSA to evaluate the grizzly bear habitat suitability models". It is unclear what this statement means or the significance of this statement to the reliability of the habitat modeling? Fouth paragraph on page 15-56. "The grizzly bear summer habitat model considered the results of ecosystem mapping; no topographic features were considered. The grizzly bear summer WHRs were based on vegetation forage production associated with identified ecosystem units.." This limits the assessment of grizzly bear habitat and weakens our confidence in the habitat modeling. Grizzly bear habitat is most likely underestimated.	Wherever possible, animal observations collected during baseline studies were compared to the results of habitat suitability mapping as a method of evaluation. However, relatively few grizzly bear observations were collected in habitats farther away from the Project; most observations were collected near the Project (e.g., along roads, near the airstrip). Thus, this statement was added to discuss how few observations were available to test whether grizzly bear were more frequently seen in higher suitability habitats throughout the Project area. Also see response to TKN-085 with regards to habitat suitability modelling. The statement that no topographical features were used in habitat suitability modelling for grizzly bear was used strictly to differentiate them from other species' models that did consider topographic features in addition to the vegetation communities/ecosystems units identified within the Terrestrial Ecosystem Mapping (TEM), such as moose, mountain goat, caribou, and hoary marmot (See Appendix 15-B for modelling processes). Modelling of grizzly bear habitat typically uses vegetation communities/ecosystems units to identify suitable habitat. Furthermore, topographic considerations (e.g., elevation) were considered in the modelling process for grizzly bear, as all seasonal ratings were based on forage potential at the time of year within each ecosystem units, and thus considered the vegetation phenology (e.g., lower elevation ecosystems with emerging spring vegetation were rated the highest in the spring, and as vegetation phenology progresses, higher elevation ecosystems with newly emerged forage were rated high in the summer through fall).	5-Aug-16
TKN-129.1	10-Oct-16	J. Prive, EDI	Wildlife and Habitat	Because ground-truthing (i.e. field sampling) was not performed as part of model development as per RISC 1999 standards, as a secondary source of field data animal observations or sign of animals during baseline data collection could be used to refine the models. The proponent states that where possible, animal observations were used to evaluate the models. Please provide more information on how this was done and for which species models, animal observations were used to refine the models. Additionally, results of ALL animal observations and animal sign for all years of baseline collection should be included in figures for each species.	Following requests by FLNO (FLNO-120) and TKN (TKN-085; TKN-135), AuRico has validated the Habitat Suitability Modeling using the percentages of animal observations that corresponded with High Quality or Lower Quality habitat for the following VCs: woodland caribou (early winter, late winter, spring calving, and summer seasons), moose, mountain goat, grizzly bear, American marten, and hoary marmot (includes observations of dens and individuals). The assessment was completed using baseline data from Appendix 15-A, which identifies animal observations and sign information. Results are presented in **20161020_KUG Comments_FLNRO 024.1_habitat suitability_Memo**. All observations of animals from the appropriate season were used although in some cases there were no observations of animals during a particular season (e.g. moose in early winter and grizzly bear in summer). Observations of sign were used for American marten as there were no observations of individuals. Observations of sign were also used for hoary marmot in order to supplement the dataset. The number of animals observed per season used for 20161020_KUG Comments_FLNRO 024.1_habitat suitability_Memo were as follows; Caribou early winter (5), late winter (36), spring (11), summer (16); Moose early winter (0), late winter (3); Mountain goat winter (28); summer (19 - note, an error was found with the mountain goat percentages for summer which should be high quality habitat 95% and lower quality habitat 5% rather than the 99% and 1% as stated in the memo); Grizzly bear spring (8), summer (0), fall (1); American marten winter (22), Marmot growing (39).	10-Nov-16
TKN-130	26-Jun-16	J. Prive, EDI	Wildlife and Habitat	Does not appear that capability and suitability ratings used the updated TEM data as there is a spatial difference of ~30 ha between them.	Please see response to TKN-124 for clarification for the differences in size of the baseline LSA, where habitat capability mapping studies were conducted, and the assessment LSA, where habitat suitability mapping were conducted. The approximate 30 ha difference is a result of additional mapping work conducted for Project infrastructure options which were investigated following the conclusion of baseline studies (2015). The wildlife habitat capability mapping studies were completed prior to the additional mapping in 2015 and were not updated. The wildlife habitat suitability mapping studies were completed using the updated TEM (i.e., inclusive of the additional mapping mentioned above). Wildlife suitability mapping was the basis for the assessment.	5-Aug-16
TKN-131	26-Jun-16	J. Prive, EDI	Wildlife and Habitat	Last paragraph on page 15-67. Capability modelling on Living (during the growing season and combines feeding and security) and Hibernating life requisites; Suitability modelling is only based on Growing Habitat. Seems that a sentence is missing explaining the focus on the growing season for suitability in the second paragraph on page 15-68.	Marmot colonies are restricted in size and they hibernate in the same burrows they occupy during growing season. Growing season vegetation communities are key for survival of marmots, thus growing season models also identify area marmots will occupy in winter.	5-Aug-16
TKN-132	26-Jun-16	J. Prive, EDI	Wildlife and Habitat	Eastern Red Bat is currently provincially ranked "SU" = unrankable (updated in 2015). Update all applicable text and also update Table 15.3-2.	The comment is noted. The difference in provincial rank of the East Red Bat does not have any effect on the assessment results related to bat.	5-Aug-16
TKN-133	26-Jun-16	J. Prive, EDI	Wildlife and Habitat	Baseline Studies were conducted in 2014 yet Table 8.3-1 indicates no bat baseline data was collected, please revise.	The comment is noted. Table 8.3-1 should have included a reference to bat studies conducted in 2014. This error does not have any implication to the results of the effects assessment on bats.	5-Aug-16
TKN-134	26-Jun-16	J. Prive, EDI	Wildlife and Habitat	~20 days of bat data is typically not accepted as enough baseline data. CWS would like more seasonal data (spring, summar and fall), furthermore the current MOE BMP recommendation "is for a minimum of a full year of surveys at all potential habitats in a site and preferably two years in a site rich with bat roosting habitat such as old abandoned mines (Altenbach et al. 2000). " Only 3 sites were chosen and no searches for possible roosts/hibernacula were performed. Could not find in Appendix 15-A any accompanying metrological data (minimum temperature, precipitation, wind speed, barometric pressure and moon phase) to correlate with the activity data.	Bats were detected in the LSA. In absence of detailed inventory data it was assumed that species at risk will occur on site and appropriate mitigation and management was included to reduce impact. The LSA does not have geology that may support hibernacula and that may be impacted by the project.	5-Aug-16
TKN-134.1	10-Oct-16	J. Prive, EDI	Wildlife and Habitat	Now that the Bat BMP is available, which was available as a draft document at the time of writing the application, a wildlife management and monitoring plan should be aligned with the recommended mitgation, management and monitoring identified in the Bat BMP.	Aurico will update the Wildlife Management and Monitoring Plan to support future permitting processes and will consider mitigation activities and guidance provided in the Best Management Practices for Bats in British Columbia. At a minimum AuRico commits to completing 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 in a suitable location.	4-Nov-16
TKN-134.2		J. Prive, EDI	Wildlife and Habitat	Thank you for this committment, we would add some additional wording to support species diversification. "At a minimum AuRico commits to completing 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 artifical roost trees (Noteman 1998; Dillingham et al 2003) in suitable locations. Location and design to accomodate the various species identified onsite according to the BC Community Bat Program. Monitoring of the bat activity onsite will include determination of the level of occupancy, use and maintenance of structures."	Comment acknowledged.	21-Dec-16
TKN-135	26-Jun-16	J. Prive, EDI	Wildlife and Habitat	Only using p-values from Kaledoscope for confidence of presence/absence of bat species in the study area is quite risky without further validation. It is understood that mist netting was not performed to validate Kaledoscope results, therefore at a minimum a manual check on a percentage of the data should have been conducted as a quality assurance measure to increase confidence in the Kaledoscope results.	Ideally, this data verification would have occurred. However, the assessment was based on availability of potential suitable hibernaculum and roosting habitat. It was assumed that species either verified during baseline surveys or potentially occurring in the area occupy suitable habitat. Further verification of baseline data would not change the conclusions of the assessment or associated mitigation.	5-Aug-16
TKN-135.1	10-Oct-16	J. Prive, EDI	Wildlife and Habitat	This is not a question of the assessment, this is a question of understanding the current condition. Regardless, no further action required.	Comment acknowledged.	4-Nov-16
TKN-136	26-Jun-16	J. Prive, EDI	EA Method	Why was foraging not considered in the habitat mapping, when it is requested in the bat BMP as part of the assessment of bat effects from mine development?	Roosting habitat is also used as foraging habitat for "gleaning" bat species (e.g., northern long-eared myotis) and is thus considered under the assessment of effects to roosting habitat. Open areas for "hawking" foraging bats is considered in the wetlands assessment (Chapter 13 Terrestrial Ecology Effects Assessment) as well as being identified through the western toad (p. 15-96) and wetland bird (p. 15-82) habitat mapping exercises. No residual effects of the Project were predicted for wetlands, and habitat loss and alteration for both western toad and wetland birds were also not considered residual effects. Measures have been identified to maintain the ecological integrity of these open areas that could be used by "hawking" bat species in association with the assessment of these VCs. Examples of such measures include maintaining a riparian buffer of 30 m, and larger where possible, around western toad breeding habitat in agreement with the 2014 best management practices for amphibians and reptiles (BC MOE 2014; Table 24.19-1. Wildlife VC Sensitive Periods, p. 24-151). BC MOE. 2014. Guidelines for Amphibian and Reptile Conservation during Urban and Rural Land Development in British Columbia. BC Ministry of Environment: Victoria, BC	5-Aug-16
TKN-136.1	10-Oct-16	J. Prive, EDI	EA Method	Bat fidelity is much higher with roosting habitat than with foraging habitat. Since limited surveys were conducted we understand why it difficult to separate these.	Comment acknowledged	4-Nov-16
TKN-137	26-Jun-16	J. Prive, EDI	EA Method	What about blasting as a sensory disurbance?	Blasting was included in noise modelling (Chapter 7.2 and Appendix 7-D of the Application) and as such is captured by the general term of noise.	5-Aug-16
TKN-137.1	10-Oct-16	J. Prive, EDI	EA Method	It is more than noise, what about vibrations and infra-noise? EDI recommends specific mitigation associated with blasting for various wildlife receptors in a wildlife management plan be a condition/requirement of an EA certificate.	Surface blasting will be limited to the construction phase only. The predicted blasting values and instantaneous noise levels (Appendix 7-2) do not represent a constant or permanent emission that would be experienced on a daily basis throughout the life of the project. The predicted values will only be experienced for limited periods of time. Considering the above, specific mitigation for blasting is not deemed necessary.	4-Nov-16
TKN-137.2	23-Nov-16	J. Prive, EDI	EA Method	After reviewing Appendix 7-2 again, agreed that noise and blasting inputs are not constant or permanent, though they do occur and the wildlife surrogate used in the model did experience noise, blasting and overpressure values above the thresholds. As such TKN recommends that a Blast Management Plan be prepared during construction and operations to minimize the sounds and disturbance levels that may affect wildlife. Included would be standard mitigation at the discretion of the Blaster in Charge, such as use of timing windows, blasting mats, reduced charges and smaller rolling charges instead of larger instantons charges. Blasting within 1000 m of important features should ensure sound concussion is less than 150 decibels, that the shock wave is less than 1.5 p.s.i. and the peak particle velocity is less than 15 mm/second. No blasting should occur within 300 m of valuable bat habitat features (MFLNRO, A Compendium of Wildlife Guidelines for Industrial Development Projects in the North Area, British Columbia, 2014).	Wildlife mitigation measures related to noise will be included in a subsequent version of the Wildlife Management and Monitoring Plan to be prepared to support the Mines Act permitting process.	21-Dec-16

Kemess Underground Application Review - TKN Issues Tracking Table - January 6, 2017

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ID #	**Comment Date**	**Reviewer Name / Agency (i.e. Alex Kwang, MEM)**	**Subject (See "instructions" tab)**	**Comment (Include Memo reference as applicable)**	**Proponent Response (Include Memo reference as applicable)**	**Response Date**
TKN-138	26-Jun-16	J. Prive, EDI	EA Method	Extrapolation of habitat suitability from the TEM-centric LSA to the RSA is a limitation of the assessment (paragraph 3 on page 15-154). Yet the implications of this limitation are not fully discussed in the Application. Does this mean that the habtiat could be under-estimated or over-estimated in the RSA? How is the Proponent dealing with this uncertainty in the modeling?	The effects assessment evaluated the loss of high quality habitat due to the construction of the Project within the Project footprint compared to the amount of high quality habitat in the Local Study Area (LSA). Habitat Suitability Modeling (HSM) was conducted within the LSA to determine the relative amount of high quality habitat in that area. The determination of whether the effect of habitat loss was residual or significant was based on the comparison with the LSA, therefore the lack of HSM in the Regional Study Area (RSA) does not affect the conclusions of the EA. In addition to the analysis above, the area lost was compared to the habitat in the RSA to give the effect of habitat loss a regional perspective. Since HSM was not available for the RSA, the proportion of high quality habitat in the LSA was extrapolated to the RSA. Potential limitations of the EA were discussed on page 15-154, where this extrapolation and the uncertainty that it adds to the results was discussed.	5-Aug-16
TKN-139	26-Jun-16	J. Prive, EDI	Wildlife and Habitat	Please clarify the rationale of Confidence and Risk of Disruption to Movement on Grizzly Bear, it is unclear. Page 15-221.	The confidence is rated as moderate as it was not confirmed whether grizzly bear move through the area where the KUG access corridor and water discharge line will be located, and thus it is not definite that disruption of movement will occur (i.e., could not be rated as high).	5-Aug-16
TKN-140	26-Jun-16	J. Prive, EDI	Wildlife and Habitat	Significance of attractants on Grizzly Bears is not fully rationalized as it cannot be fully mitigated. Please provide further rationale to justify characterizing this residual effects as non-significant. For example, the authors identify that "attraction for bears has previously been an issue at the KS Mine". Numbers of conflicts and potential bear mortalities would be available for the KS Mine and should be provided as supporting rationale for the "non-significant" determination of residual effects of attractants on Grizzly Bear.	Information on bear mortalities at the Project was described on p. 15-224 of the Application "Between 2001 and 2005 a total of 12 bears (grizzly and black bears combined) were destroyed at the KS Mine site (Appendix 15-A). Since the implementation of the KS human bear conflict prevention plan in 2005, there have been 2 bears destroyed". This result indicates the effectiveness of the KS human bear conflict prevention plan to reduce the incidences of attraction of bears the Project and subsequent human-bear conflict. The plan will continue to be implemented, in addition to the mitigation proposed for eliminating bear conflicts as detailed in Chapter 24, section 9. While residual effects are anticipated, implementation of these recommendations will ensure effects are not significant.	5-Aug-16
TKN-140.1	10-Oct-16	J. Prive, EDI	Wildlife and Habitat	Thank you for the explanation	Comment acknowledged.	4-Nov-16
TKN-141	26-Jun-16	J. Prive, EDI	Wildlife and Habitat	Rationale for hoary marmot habitat loss and alteration significance is unclear. The residual effects are considered to be not significant even though no mitigation is provided. Please provide more information to justify your "not significant" determination.	The marmot population is not at risk and distributed widely across the RSA. Impacting the small area associated with the subsidence area and associated marmots will not result in a substantial impact to the population.	5-Aug-16
TKN-141.1	10-Oct-16	J. Prive, EDI	Wildlife and Habitat	Hoary Marmot (i.e. Groundhogs) are very important to TKN as a delicacy and used for medicinal purposes. The TKN TLUS report (Appendix 20-A) identifies the area near the subsidence cone as a TKN trapping area and accounts from TKN members identify the mountains and Thutade Lake area as important groundhog trapping area. Although Hoary Marmot may not be at risk, any effects to the local colonies would be considered significant for TKN. A mitigation and management plan for Hoary Marmot should be developed to minimize impacts of habitat loss and alteration, including sensory disturbance from the Project.	Mitigation and management specific to hoary marmot is included in the conceptual Wildlife Management and Monitoring Plan (Section 24.19) submitted with the Application. Pre-construction surveys will be carried out to identify marmot dens within the subsidence zone and within the 250 m buffer area (Table 24.19-1). Any active dens found during pre-construction surveys will be monitored through operations (Table 24.19-2). If subsidence affects these dens then additional mitigation may be warranted. Monitoring of subsidence will occur through the Subsidence Effects and Terrain Monitoring Plan (Section 24.14). Furthermore, AuRico continues its ongoing communication with TKN leadership regarding TKN participation in site monitoring during operations & closure. TKN members will be employed directly by AuRico for monitoring and reporting activities. TKN members will be members of the Environmental Management Committee that is expected to participate in development of EMPs (i.e. included as part of IBA).	4-Nov-16
TKN-141.2	23-Nov-16	J. Prive, EDI	Wildlife and Habitat	TKN agrees with proposed mitigation and management of the hoary marmot. TKN proposes to add additional wording to the Wildlife Management Plan to the effect that if affects to the marmot population occur an adaptive management approach will be implemented. This may include enhancement of nearbry existing lower quality marmot habitat and/or relocation of the marmot colony to nearby suitable habitat.	The conceptual Wildlife Management and Monitoring Plan (WMMP) provided in section 24.19 of the Application states "Results from on-site wildlife monitoring will be used to identify potential opportunities for adaptive management. In conjuction with the monitoring program results, the evaluation of mitigation measures applied to manage wildlife will help determine if prescribed measures are achieving performance objectives." The next iteration of the WMMP will include additional wording around adaptive management measures.	21-Dec-16
TKN-142	26-Jun-16	C.Coady, EDI	Wildlife and Habitat	Dates of the BC BBA were noted in Section 4.5 (Existing Studies) as July and August 2011. It is unlikely that bird surveys conducted after early July are reflective of "breeding" birds, so the data from the BC BBA may not be accurate and thus may not inform the effects assessment in relation to breeding birds. In addition, incidental observations in 2013 and 2014 were performed in late July - August (Section 4.6.2). Similar to the BC BBA data, the data will not be representative of breeding birds. Therefore, the main breeding bird evidence collected was in one year (2006). The potential limitations on use of third party data and incidental data from the non-breeding /end of the breeding season should be discussed in Section 4.7 (Limitations and Assumptions).	Noted. The assessment is not determined to be limited by these baseline data because the assessment included groups of birds with similar habitat and behavior, and it used representative indicator species (e.g. olive-sided flycatcher) and groups with similar habitat requirements (e.g. cavity nesting waterfowl, wetland dependent birds, landbirds etc.) to inform the assessment. Furthermore, habitat that was suitable for the indicator species or species groups was assumed to be occupied even if baseline surveys had not verified this assumption. Habitat included in the assessment for migratory waterbirds was habitat appropriate for wetland breeding birds (Figure 15.6-30), cavity nesting waterfowl (Figure 15.6-31) , and riverine birds (Figure 15.6-32). For migratory landbirds, all three biogeoclimatic subzones were included in the assessment as migratory bird nesting may occur in all three (Figure 15.6-36).	5-Aug-16
TKN-142.1	10-Oct-16	C.Coady, EDI	Wildlife and Habitat	One year of baseline breeding bird data is a limitation of the assessment, as a quantitative assessment to the current conditions cannot occur from only one year. Regardless, no further action required.	Comment acknowledged.	4-Nov-16
TKN-143	26-Jun-16	C.Coady, EDI	Wildlife and Habitat	Although the number of species observed in the LSA and RSA has been identified, there is no relative measure of survey effort between the RSA and LSA, so the numbers are likely not relevant or provide any ecological meaning to reviewers. Can the Proponent provide a relative measure of survey effort for the LSA and RSA so that the numbers presented in Table A4-1 can be used in the effects assessment?	The assessment was based on effects to potential suitable habitat for aquatic birds i.e. wetlands, riverine, and cavity-nesting habitats. As such, determining relative abundance differences of species between the LSA and RSA would not alter the conclusions of the assessment nor the associated mitigation.	5-Aug-16
TKN-144	26-Jun-16	C.Coady, EDI	Wildlife and Habitat	There are no baseline summaries of species-specific habitat availability within the Project footprint or LSA versus what is available in the RSA. Are there any unique or important habitats that may be impacted by the Project that are limited or not available in the RSA?	Habitat suitability modelling was conducted for a variety of VCs representing a range of habitat requirements (Habitat Suitability baseline Appendix 15-B). The assessment extended effects from these species and groups to wildlife with similar habitat requirements. Important features such as stick nests and mineral licks were inventoried in conjunction with past baseline survey effort and results presented in Appendix 15-A. No unique habitats are anticipated to be impacted. Additionally, the Project footprint area includes 487 ha, where < 100 ha is due to the infrastructure itself and the remaining area is due to buffers around infrastructure. The additional area is being included in order to account for final siting changes as well as habitat alteration due to construction activities around the infrastructure. Therefore, all habitat loss and alteration estimates presented are highly conservative as it is anticipated that as little as 15% of the total footprint area will actually be affected.	5-Aug-16
TKN-145	26-Jun-16	C.Coady, EDI	Wildlife and Habitat	Although the number of species observed in the different TEM habitat types has been identified, the relative measure of effort between habitat types is not identified therefore this information does not provide any ecological meaning. Can the Proponent provide a relative measure of survey effort for the various habitat types or provide more information on the importance of various habitat types to breeding birds in the Project footprint, LSA and RSA to be used in the effects assessment? Table 4.8-4 provides TEM ecosystem data for each point count station in 2006, therefore it appears this relative measure of effort could be calculated for at least that year.	Habitat suitability modelling was conducted for a variety of VCs representing a range of habitat requirements (Habitat Suitability baseline Appendix 15 B). The assessment extended effects from these species and groups to wildlife with similar habitat requirements. The presentation of relative use of wildlife is not considered material to the assessment.	5-Aug-16
TKN-146	26-Jun-16	C.Coady, EDI	Wildlife and Habitat	This table has a few errors related to conservation status of species. As of 2015, Cape May Warbler is Blue listed in BC and Red-necked Phalarope is Special Concern under COSEWIC (2014). Missing from the list is Bank Swallow (Threatened - COSEWIC). These errors may have an influence on the effects assessment and mitigation/management plans related to these specific species.	Comment noted. As mitigation and management (Chapter 24, section 9) is broad and focused on reducing effects on all wildlife, the changes in status will not alter the assessment outcome.	5-Aug-16
TKN-146.1	10-Oct-16	C.Coady, EDI	Wildlife and Habitat	This change in status may not affect the assessment outcome, however, accurate information is an important aspect of any acceptable application. No further action required.	Comment acknowledged.	4-Nov-16
TKN-147	26-Jun-16	C.Coady, EDI	Wildlife and Habitat	Concerned that point count surveys were not performed in Attichika Creek and wetlands where mine site discharge will be and could potentially effect terrestrial birds that breed in aquatic environments (e.g. Rusty blackbird) . If not identified in the baseline information, the effect of the Project's discharge water on these breeding birds may be underestimated and not considered as a potential project effect for these species. Please indicate why point counts would not be needed for these areas and how the baseline report will still inform the effects assessment.	The assessment proceeded assuming that rusty blackbird and other species at risk detected during baseline inventory for this project or nearby could occur in all areas of the LSA that supported suitable habitat.	5-Aug-16
TKN-147.1	10-Oct-16	C.Coady, EDI	Wildlife and Habitat	The point being made by this reviewer is that for example, Olive-sided Flycatcher (OSFL) was documented breeding in the LSA, and as such species-speciific modeling for this listed species was performed and any amount of habitat loss was carried forward into the cumulative effects assessment which appears to be solely due to the conservation status of this species. If point counts were performed in the weltand habitats, Rusty blackbirds and Common Nighthawk for example may have been documented breeding and thus it is assumed that a similar approach would have been completed for these listed species as was performed for OSFL. Because an appropriate level of survey effort for terrestrial birds was not achieved in wetland areas, this is a limitation to the assessment. The Wildlife management and mitigation plan should include appropriate mitigation for breeding birds, including avoiding bird breeding timing windows and appropriate level of mitigation if clearing is planned during timing windows. TKN should be provided a meaningful opportunity to review this plan and support it's implementation where feasible.	The Wildlife Management and Monitoring Plan includes appropriate mitigation for breeding migratory birds, including: avoid vegetation clearing during the bird breeding season; and conduct point count surveys within seven days prior to vegetation clearing if clearing occurs during breeding season. The breeding season was defined as April 1 to July 31 in the Application (Chapter 15 and Chapter 24), however, based on recommendations provided by ECCC (ECCC- 101) to extend this period, the breeding bird season will be revised in the final Wildlife Management and Monitoring plan to include the period between April 15 and August 15th. Additional measures that will be taken during Operations for applicable VCs are outlined in Chapter 24, Table 24.19-2. For migratory birds these include monitoring infrastructure for evidence of nesting and adaptive management as necessary based on species. It is anticipated that TKN will participate in the permit review process as a member of the Mine Review Committee to be established by the MMPO and will have an oppurtunity to comment on management plans submitted as part of the application package. AuRico is also discussing additional TKN participation in development and implementation of EMPs as a part of ongoing IBA discussions.	4-Nov-16
TKN-148	26-Jun-16	C.Coady, EDI	Wildlife and Habitat	Concerned that point counts and aerial surveys were not performed near the Access Corridor. Raptor stick nests and species of concern (e.g. Northern Goshawk nests) could be present in these areas which will inform the effects assessment and potential mitigation and management plans. Please provide rationale for why baseline breeding bird data were not collected for this area.	Limited high quality habitat was identified within the Access Corridor area for northern goshawk (Figure 15.4-17). The assessment assumed the presence of nesting migratory landbirds birds within all biogeoclimatic zones in the LSA (Section 15.6.11.1) and appropriate mitigation will be implemented in order to be in compliance with the Migratory Birds Convention Act and BC Wildlife Act.	5-Aug-16
TKN-149	26-Jun-16	C.Coady, EDI	Wildlife and Habitat	Observations of grouse/ptarmigan and other species of conservation concern have been identified on these maps. The timing of the observations has not been identified in the legend. Please include this information so that the reviewer understands what time of year (breeding versus non-breeding) these species or their sign were observed.	Observations of ptarmigan and grouse species were collected year round, as these species are considered to be non-migratory. Observations of dusky grouse, spruce grouse, rock ptarmigan, and white-tailed ptarmigan individuals, as well as an unspecified grouse and ptarmigan individual, were recorded during the breeding period (April 1 - July 31), and willow ptarmigan were observed during both the breeding and non-breeding (July 31 - April 1) period. Grouse and ptarmigan sign (e.g., pellets, body parts, tracks) were recorded during the breeding and non-breeding periods. Observations of species of conservation concern were recorded both during breeding and non-breeding periods. Barn swallow, horned grebe, long-tailed duck, olive-sided flycatcher, and short-eared owl were all observed during the breeding and non-breeding periods, while tundra swan and surf scoter were only observed during the non-breeding period.	5-Aug-16
TKN-150	26-Jun-16	C.Coady, EDI	Wildlife and Habitat	Concerned that Short-eared owl (SARA-listed - Special Concern) breeding habitat is not inclusive of alpine/parkland habitat in the LSA. Short-eared owl (SEOW) sign was observed in these habitat types ~1 km north of the proposed subsidence zone and at top of ridge west of Kemess Creek according to Figure 4.8-4 in the Wildlife Baseline Report (Appendix 15-A) and literature has identified these habitat types as important for breeding and foraging (MELP 1998; Sinclair et al. 2003; COSEWIC 2008). SEOW habitat was only mapped as wetland/meadow habitat at lower elevations, and did not include alpine/parkland habitat where SEOW sign was found within the LSA. The potential Project effects on this species may be under-estimated in the Effects Assessment and Cumulative Effects Assessment and not properly mitigated/managed if the appropriate habitat type for SEOW is not identified. At a minimum, please include the following ecosystem subzones into the habitat modeling for this species as SEOW sign was documented within these areas: LSA BAFAun/TA, FW, HL and SBSmks/FH, SA and re-assess the project effects on this species. References: Ministry of Environment Lands and Parks 1998 - British Columbia's Wildlife at Risk - Short-eared Owl; Sinclair, P, Nixon, WA, Eckert, CD, Hughes, NL. (2003) Birds of the Yukon Territory (p294-295); COSEWIC 2008 - Assessment and update status report on the short-eared owl in Canada.	Alpine tundra was included in the assessment for migratory landbirds. Habitat loss occurring in the alpine tundra was calculated as 13.1 ha which occurs primarily within the buffer of the road to the proposed exhaust ventilation raise and represents 0.6% of the alpine tundra habitat available in the LSA. Habitat alteration will occur within the subsidence area and 250 m buffer of it, however, this area is devoid of vegetation. Potential sensory disturbance will be negligible in this area as there will only be occasional checks of the proposed exhaust ventilation raise. As such, effects to birds in the alpine tundra area are considered negligible when considered in isolation from other habitat types included in the assessment. In addition, habitat loss within the SBSmks BEC Subzone was also considered in the assessment for migratory landbirds. Habitat loss occurring in the SBSmks was calculated as 97.7 ha and represents 1.6% of the SBSmks habitat available in the LSA. Habitat alteration will occur within the subsidence area and 250 m buffer of it, which accounts for an additional 55 ha (0.33% of LSA) of potential loss. Potential sensory disturbance within the SBSmks accounted for less than 1% of available habitat within the LSA for all noise sources save for traffic noise, which was expected to disturb up to 2.59% of available habitat within the SBSmks. Considering the above, effects to birds in the SBSmks are minor when considered in isolation from other habitat types included in the assessment. By extension using the above results, the effects to short-eared owl using higher elevation habitats in BAFA and SBSmks would be considered negligible to minor, and these results, in concert with the evaluation conducted for short-eared owl in the assessment, indicate that the overall conclusion of the assessment is still valid and no additional effects to short-eared owls nesting in higher elevation habitat are expected to occur.	5-Aug-16

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ID #	**Comment Date**	**Reviewer Name / Agency (i.e. Alex Kwang, MEM)**	**Subject (See "instructions" tab)**	**Comment (Include Memo reference as applicable)**	**Proponent Response (Include Memo reference as applicable)**	**Response Date**
TKN-150.1	10-Oct-16	C.Coady, EDI	Wildlife and Habitat	By this response, if BAFA and SBSmks BEC zones were added to the SEOW habitat modeling, it would add another 110 ha of habitat loss to the 25.6 ha of habitat loss and alteration already identified in addition to whatever habitat is altered due to sensory disturbance in the BAFA and SBSmks zones. Limitations in modeling and assessment highlight concerns regarding potential effects to SEOW Additional management to reduce potential effects to Alpine-associated bird species (e.g. ptarmigan, short-eared owl) should be developed. This plan should be a requirement of the terms and conditions of the EA certificate and should include TKN involvement in reviewing and implementing the plan.	Habitat loss occurring in the alpine tundra was calculated as 13.1 ha; this habitat is primarily within the 50 m buffer of the road to the proposed exhaust ventilation raise and represents 0.6% of the alpine tundra habitat available in the LSA. Habitat alteration will occur within the subsidence area and 250 m buffer of it, however, this area is composed mostly of talus and scree and so is not likely to represent high quality habitat for breeding short-eared owls. Suitable habitat was identified in the Application within the Spruce Willow Birch (SWB) BEC zone. Suitable habitat was defined as open areas, including wetlands. The amount predicted to be lost or altered for short-eared owls was 25.6 ha and represents 2.5% of the suitable habitat in the LSA. Together with the alpine tundra habitat loss, this represents a combined loss of 38.7 ha and 3.8% of the suitable habitat in the LSA. This value is equivalent to one or fewer short-eared owl breeding pair territories, based on known breeding territory sizes ranging from between 20 ha based on data from Alaska (Pitelka et al. 1995; Wiggins et al. 2006) and 73.9 ha based on data from grassland habitat in Manitoba (Clark 1975). The additional habitat lost or disturbed after incorporating potentially suitable alpine tundra habitat is not expected to change the results of the effects assessment for habitat lost and altered because fewer than one breeding pair would be affected by the loss. Potential sensory disturbance will be negligible in this area as there will only be occasional checks of the proposed exhaust ventilation raise. As such, effects to short-eared owls in the alpine tundra area are considered negligible when considered alone. However, 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; BC MOE 2013). 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. BC MOE. 2013. Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia (2013). British Columbia Ministry of Environment: Victoria, BC. Clark, R. J. 1975b. A field study of the Short-eared Owl (Asio flammeus) Pontoppidan in North America. Wildl. Monogr. no. 47:1-67. Pitelka, F. A., P. Q. Tomich and G. W. Treichel. 1955b. Ecological relations of jeagers and owls as Lemming predators near Barrow, Alaska. Ecol. Monogr. no. 25:85-117 Wiggins, D. A., Denver W. Holt and S. M. Leasure. (2006). Short-eared Owl (Asio flammeus), The Birds of North America (P. G. Rodewald, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America: https://birdsna.org/Species-Account/bna/species/sheowl. DOI: 10.2173/bna.62	4-Nov-16
TKN-150.2	23-Nov-16	C.Coady, (J. Prive) EDI	Wildlife and Habitat	Agree with prescribed mitigation: Pre-clearing surveys will occur for short-eared owl in alpine tundra, areas where sign was previously identified and areas identified as suitable habitat in the Application starting March 1 to September 15 (i.e. earlier than for migratory birds; BC MOE 2013). 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 habitat.	No further response required.	21-Dec-16
TKN-151	26-Jun-16	C.Coady, EDI	Wildlife and Habitat	Incorrect reference to Appendix 4 of baseline report when should be Appendix 6.	The comment is noted.	5-Aug-16
TKN-152	26-Jun-16	C.Coady, EDI	Wildlife and Habitat	It is not clear how suitable terrestrial bird habitat was identified in the LSA. This section states "Habitat loss and alteration assessments for [...migratory landbirds...] were evaluated from identifying important habitat features using geological mapping data and/or vegetation mapping (TEM and VRI data). The development of TEM is described in Chapter 13, Terrestrial Ecology. " - This statement does not provide enough information for the reviewer to understand how terrestrial bird habitat was mapped. The habitat requirements for terrestrial birds are diverse (e.g. ptarmigan versus warblers) therefore a better understanding of how the proponent assessed impacts to terrestrial bird habitat is necessary to understand if the various habitat types were included and if so, which habitat types were primarily lost or altered from the Project.	Further details regarding how habitat loss and alteration was determined for migratory landbirds are given in Section 15.6.11.1 where is specifies "As landbirds are ubiquitous throughout the LSA, habitat loss and alteration was calculated for all the BEC zones within the LSA that overlapped with the individual Project components (Table 15.6-19)."	5-Aug-16
TKN-152.1	10-Oct-16	C.Coady, EDI	Wildlife and Habitat	This reviewer does not agree with this approach to habitat modeling for terrestrial landbirds because of the diverse requiements for this very broad group of birds. Regardless, no further action required.	Comment acknowledged.	4-Nov-16
TKN-153	26-Jun-16	C.Coady, EDI	Wildlife and Habitat	This section identifies that waterbird broods and juveniles were observed in the Waste Rock Creek (WRC) wetland and would be feeding in these areas for growth and development. Although it doesnt appear that selenium levels have been modeled for the wetlands, it appears the proponent is assuming that WRC wetlands will also have elevated levels of Se similar to the creek. The proponent states that the birds wouldn't be in the wetlands for long and that adults and nestlings/juveniles would soon move to larger waterbodies where selenium is not predicted to be elevated. The proponent concludes that there would be negligible effect of bioaccumulation of selenium up the food web for migratory waterbirds (first paragraph p 15-294). I disagree. Reproduction, particularly the period leading up to and during egg-laying when embryonic defects can result from Se in the adult diet, is the most sensitive period for the effects of selenium on birds (Heinz et al. 1989; Ohlendorf 1996; Adams et al. 1998; Wayland et al. 2007). The baseline information has documented breeding in the wetlands and regardless of whether or not the adults and nestlings/juveniles move away from this area after breeding and hatching, the potential effects of Se in the food web will have already occurred. The potential effects of selenium on breeding waterbirds in the Waste Rock Creek wetlands should not be deemed negligible. References: Heinz GH, Hoffman DJ, and Gold LG. 1989. Impaired reproduction of mallards fed an organic form of selenium. J Wildl Manage 53:418–28. Ohlendorf HM. 1996. Selenium. In: Fairbrother A, Locke LN, and Hoff GL (eds.), Noninfectious Diseases of Wildlife, 2nd edition, pp 465–500. Iowa State University Press, Ames, IA, USA. Adams WJ, Brix KV, Cothern KA, et al. 1998. Assessment of selenium food chain transfer and critical exposure factors for avian wildlife species: Need for site-specific data In: Little E, DeLonay AJ, and Greenberg BM (eds.), Environmental Toxicology and Risk Assessment: Seventh Volume ASTM STP 1333, pp 312–42. American Society for Testing and Materials, Philadelphia, PA, USA Wayland, M. Casey, R. Woodsworth, E. 2007. A dietary assessment of selebium risk in aquatic birds on a coal mine affected stream in Alberta, Canada. Human and ecologiscal risk assessment. 13:823-842.	American dipper and sandpipers are present in the terrestrial LSA and terrestrial RSA, Waterfowl Survey Areas and Breeding Bird Atlas Surveys 2003 to 2014 (Table 4.8-1 in Appendix 15-A). As stated in Section 15.4.4.2 of the Application, American dippers are riverine waterfowl with a preference for river and creek habitat. As noted in Table 4.8-1 in Appendix 15-A sandpipers are wetland shorebirds and were also identified in the terrestrial LSA and terrestrial RSA. Sandpipers and dippers are considered as part of the larger group of migratory waterbirds in the effects assessment. Effects on migratory waterbirds were considered in the residual effects assessment related to exposure to COPCs in water and COPCs bioaccumulated in the foodweb. The assessment concluded that risks to waterbirds are likely to be negligible because the concentrations of COPCs are within the range of concentrations currently measured in Waste Rock Creek and birds are likely to forage over a much wider area than just Waste Rock Creek (which decreases their exposure). The elevated selenium concentrations in Waste Rock Creek are not a Project residual effect. Selenium for the former KS Mine is being managed as part of the closure/post-closure planning for that mine. In addition, selenium will be actively managed for the KUG Project through the use of selenium water treatment technology, which will remain in place until concentrations in the TSF meet discharge criteria for release without treatment. The Fish and Aquatic Effects Monitoring Plan Section 24.7 of the Application will be implemented to monitor the concentrations of COPCs in water and biota. Based on monitoring results, adaptive management and mitigation will be implemented where necessary.	5-Aug-16
TKN-153.1	10-Oct-16	C.Coady, EDI	Wildlife and Habitat	Selenium concentrations in Attichika and Waste Rock Creek wetlands have not been modeled for the Project. Se bioaccumulation and speciation in lentic systems is different than lotic systems like Waste Rock Creek or Attichika Creek where water quality modeling was performed. It is not appropriate to compare modeling results of Attichika and Waste Rock creeks to wetland habitats themselves when it is known that bioaccumulation and speciation differs in lentic and lotic environments. Please indicate if there is a potential for COPCs (i.e. selenium) to increase beyond current levels in the Attichika and Waste Rock Creek wetlands.	As noted by the reviewer, there is no modelling node located in the wetlands. Modelling nodes in Attichika Creek (WQ-17 and WQ-17 IDZ) and Waste Rock Creek (WQ-14F) are the best available surrogates of predicted water quality for the wetlands. All potential Project-related sources of selenium and other parameters for these modelling nodes are captured as source terms in the surface water quality model (e.g., seepage, discharge from the TSF). As noted in the previous response, the primary source of selenium to Waste Rock Creek (and the wetlands) is from the former KS Mine. Selenium for the former KS Mine is being managed as part of the closure/post-closure planning for that mine. During Operations, concentrations of selenium are predicted to decrease because selenium originating from the KS waste rock piles (from the Selenium Retention Pond) will be pumped to the Mine Site for treatment. Water treatment will remain in place until parameter concentrations in the KUG TSF meet discharge criteria for release without treatment. The potential for selenium bioaccumulation in the creeks or associated wetlands is not predicted to increase beyond current levels as a result of the KUG Project. The Fish and Aquatic Effects Monitoring Plan Section 24.7 of the Application will be implemented to monitor the concentrations of COPCs in water and biota. Based on monitoring results, adaptive management and mitigation will be implemented where necessary.	28-Oct-16
TKN-153.2	23-Nov-16	C.Coady, (J. Prive) EDI	Wildlife and Habitat	With the KUG Project, the discharge criteria at closure appears to be set at "current levels" however, the effectiveness of the leach cap over the waste rock pile is expected to become more effective overtime, reducing the amount of Se in Waste Rock Creek. Therefore, without the KUG Project, it appears that Se levels are expected to decrease in WRC and levels at closure should be set at WQ guidelines or some other protective objective not related to current levels since the current levels would be decreasing if not for the KUG project. It appears that biological monitoring for selenium has not been a requirement of the KS mine Environmental Effects Monitoring plan and a bioaccumulation model has not been a requirement at the Kemess site to date. Monitoring of Se levels in biota that are sensitive to high Se concentrations (egg laying vertebrates) or receptors that would be important in the bioaccumulation pathway (benthic invertebrates) should be monitored in areas potentially affected by Kemess South and the KUG Project including Attichika Creek and Waste Rock Creek wetlands.	AuRico has committed to continue to treat water within the KUG TSF and discharge that water to the Attichika Creek through the Closure phase until water quality in the KUG TSF is sufficient for direct discharge to the Attichika Creek without treatment. The necessary water quality requirements to allow for discharge to Waste Rock Creek will be determined prior to discharge per standard Environmental Management Act permitting processes. AuRico understands that KUG specific monitoring or modelling may be required to support the necessary permitting process prior to Closure and Post-Closure phases. Developing receiving environment objectives prior to KUG related discharge will allow for appropriate consideration of background conditions at the time as well as any developments in the science of selenium effects beyond current knowledge.	21-Dec-16
TKN-154	26-Jun-16	C.Coady, EDI	Wildlife and Habitat	The effects of chemical hazards as a result of exposure to selenium in water from Waste Rock Creek has been scoped out of the assessment for landbirds as the proponent has stated that "no linkage to the aquatic food chain" occurs for landbirds. I disgree that there is no aquatic food chain linkage. Red-winged blackbirds are one of the main study species for selenium in terrestrial birds and this species is known to breed in aquatic environments and have a diet consisting of both terrestrial and aquatic invertebrates (Harding 2008). Studies have documented that red-winged blackbird eggs have been found to have significant selenium uptake in exposed areas, and although this species appears to have a high tolerance threshold to egg selenium, effects of elevated selenium in eggs has been documented (Frankenberger and Engberg (1998)), and identifies that other terrestrial breeding birds that inhabit these areas are exposed and can potentially be affected by increased selenium concentrations in water. A closely related species, rusty blackbird, is a SARA-listed species and has been documented in the RSA, however, it's presence in the Waste Rock Creek or Attichika Creek wetlands is unknown as no point counts or surveys for terrestrial birds during the breeding season have been performed in these areas. If rusty blackbirds breed in these wetlands they may be exposed to increased levels of selenium in the food web due to the Project. References: Frankenberg and Engberg (editors) (1998) - Environmental Chemistry of Selenium; Harding (2008) - Non-linear uptake and hormesis effects of selenium in red-winged blackbirds.	Please see the response to TKN-153	5-Aug-16
TKN-154.1	10-Oct-16	C.Coady, EDI	Wildlife and Habitat	Please see comment related to comment/response TKN-153 (i.e. TKN-153.1)	Please see the response to TKN-153.1.	28-Oct-16
TKN-154.2	23-Nov-16	C.Coady, (J. Prive) EDI	Wildlife and Habitat	Same comment as TKN-153.2	Please see the response to TKN-153.2.	21-Dec-16
TKN-155	26-Jun-16	C.Coady, EDI	Wildlife and Habitat	It is unclear how/if COPCs were modelled for the wetlands (i.e. waste rock creek wetlands and Attichika wetlands). Is there a potential for COPCs to accumulate differerently in these lentic systems versus the lotic systems where modeling was performed? This has implications for species breeding and foraging in these wetlands and the potential effects of project COPCs on these species. It appears from Appendix 11-A Surface water quality baseline report, that selenium is already elevated in these wetlands. Please provide rationale for why wetlands were not modelled for selenium or other contaminants of potential concern as TKN has concerns related to bioaccumulation of contaminants in fish and wildlife.	There were no surface water quality modelling nodes located in the wetlands; however, modelling nodes were located in Attichika Creek and Waste Rock Creek. As predicted selenium concentrations are within the range of existing variation in Waste Rock Creek, residual Project effects on waterbirds are not expected (Section 11.6.2.1 of the Application). Potential effects to Attichika Creek from elevated selenium concentrations will be mitigated by metals removal and Se-IX™ (selenium) treatment prior to discharge (Section 11.6.2.1 of the Application). Selenium is not predicted to be greater than applicable water quality guidelines as a result of Project activities in Attichika Creek during Operations and Closure (Section 11.6.2.1 of the Application). Both mercury and selenium have the potential to bioaccumulate. As shown in Tables 14.4-2 and 15.2-1 of the Application, both of the BC MOE tissue residue guidelines for the protection of wildlife/aquatic life (muscle, whole body, and eggs) for mercury and selenium were used in the contaminant of potential concern (COPC) screening process. The screening of COPCs due to consumption of fish by wildlife is described in Section 15.5.2.2 of the Application. Sections 15.6.9.5 (Chemical Hazards on Raptors), 15.6.10.4 (Chemical Hazards on Waterbirds), 15.6.11 (Potential Residual Effects Assessment on Migratory Landbirds), 15.6.12.5 (Chemical Hazards on Western Toad) of the Application provide further information on the assessment of the potential for bioaccumulation and toxicity of these compounds in wildlife. No Project residual effects were identified for these wildlife VCs. As shown in Table 18.2-1 of the Application, the BC MOE human consumption fish tissue guidelines for selenium and mercury were included in the assessment. Only selenium was identified as a COPC in fish tissue for human consumption (Section 3.6.1 and Tables 3.6-1 and 3.6-2 of Appendix 18-B of the Application). Therefore, the risk to human health from consumption of fish (as part of country foods) was evaluated in Section 18.5.2.5 of the Application.	5-Aug-16
TKN-155.1	10-Oct-16	C.Coady, EDI	Wildlife and Habitat	Please see comment related to comment/response TKN-153 (i.e. TKN-153.1)	Please see the response to TKN-153.1.	28-Oct-16
TKN-155.2	23-Nov-16	C.Coady, (J. Prive) EDI	Wildlife and Habitat	Same comment as TKN-153.2	Please see the response to TKN-153.2.	21-Dec-16

Kemess Underground Application Review - TKN Issues Tracking Table - January 6, 2017

	For Working Group Use				For Proponent Use	
ID #	**Comment Date**	**Reviewer Name / Agency (i.e. Alex Kwang, MEM)**	**Subject (See "instructions" tab)**	**Comment (Include Memo reference as applicable)**	**Proponent Response (Include Memo reference as applicable)**	**Response Date**
TKN-156	26-Jun-16	C.Coady, EDI	Wildlife and Habitat	Table 15.6-20 identifes that a total of 9.5% of suitable landbird habitat in the LSA will somehow be affected by the Project (general project noise, instantaneous traffic noise…). However, on page 15-307 when describing the residual effects of the project the paragraph states that " Less than 5% of the available suitable habitat for migratory landbirds in the LSA may be disturbed due to Project noise which represents 0.052% of the assumed available habitat within the RSA. ". Why is the total amount of suitable habitat disturbed by project noise not identified here? Also, Table 15.6-20 has incorrect values for the %LSA affected by instantaeous traffic noise (the second to last column).	The reviewer is correct, the totals of the different types of noise disturbance should have been referred to on page 15-307. The calculations in the % LSA affected by instantaneous noise were double-checked and no errors were found. These numbers represent the totals in the third to last column being divided by the first column numbers and multiplied by 100.	5-Aug-16
TKN-157	26-Jun-16	C.Coady, EDI	Wildlife and Habitat	The identified mitigation to reduce the effects of attractants on migratory birds is to remove nesting material from project infrastructure prior to egg-laying. Nests (even partially completed nests) are still protected under legislation so preventative measures should be employed to deter birds from beginning to build nests (barriers, spikes, netting, oils on surfaces and planned maintenance of these barriers). Energy expended by birds on rebuilding nests can potentially have a negative effect on individual birds.	The comment is noted.	5-Aug-16
TKN-157.1	10-Oct-16	C.Coady, EDI	Wildlife and Habitat	Any future monitoring or mitigation plans should be a requirement of the terms and conditions of the EA certificate and should include TKN involvement in reviewing and implementing the plans.	It is anticipated that TKN will participate in the permit review process as a member of the Mine Review Committee to be established by the MMPO and will have an oppurtunity to comment on management plans submitted as part of the application package. AuRico is also discussing additional TKN participation in development and implementation of EMPs as a part of ongoing IBA discussions.	4-Nov-16
TKN-157.2	23-Nov-16	C.Coady,(R. Robitaille) EDI	Wildlife and Habitat	The Proponent response is acknowledged and anticipated TKN participation in the permit review process and development and implementation of monitoring and management plans is also acknowledged.	The comment is noted.	21-Dec-16
TKN-158	26-Jun-16	C.Coady, EDI	Wildlife and Habitat	Specific mitigation/management should be identified for alpine-associated bird species that are sensitive to disturbance (e.g. white-tailed ptarmigan and other ptarmigan species) and of conservation concern (short-eared owl). There will be sensory disturbance and habitat loss/alteration within these species habitat and human presence in these areas. Due to their cultural importance to Aboriginal peoples and their sensitivity to disturbance, projects effects and specific mitigation related to these species should be identified in the Application.	Habitat loss occurring in the alpine tundra was calculated as 13.1 ha which occurs primarily within the buffer of the road to the proposed exhaust ventilation raise and represents 0.6% of the alpine tundra habitat available in the LSA. Habitat alteration will occur within the subsidence area and 250 m buffer of it, however, this area is devoid of vegetation. Potential sensory disturbance will be negligible in this area as there will only be occasional checks of the proposed exhaust ventilation raise. As such, effects to birds in the alpine tundra area are considered negligible when considered in isolation from other habitat types included in the assessment and specific mitigation measures are not considered to be warranted.	5-Aug-16
TKN-158.1	10-Oct-16	C.Coady, EDI	Wildlife and Habitat	Although the area affected may be considered negligible to the Proponent, the area of the ventilation raise and subsidence cone is upland bird breeding habitat where breeding has been documented (e.g. ptarmigan breeding in the subsidence zone). If works are occuring near these potential breeding areas during the breeding season, an appropriate level of mitigation should be focused for these sensitive species that are important to TKN. This mitigation and monitoring plan should be a requirement of the terms and conditions of the EA certificate and should include TKN involvement in reviewing and implementing the plan.	In the proposed subsidence area and ventilation access area, the habitat is primarily cliff, talus, and alpine meadow. Although white-tailed ptarmigan were observed breeding in this type of habitat, no ptarmigan species were observed breeding within the subsidence area (EA application, Chapter 15, Appendix A). Within the subsidence area the habitat potentially influenced by subsidence i.e. within the 250 m buffer, is not expected to be completely lost. The habitat is expected to remain available to breeding birds, including ptarmigan, within the 250 m buffer of the subsidence area. Pertaining to breeding in the area of the ventilation raise, proposed mitigation and monitoring includes avoiding vegetation clearing during the bird breeding season, and conducting point count surveys to identify and avoid active nest sites if clearing occurs during the breeding season (EA application, Chapter 24). AuRico recognizes that ptarmigan is a culturally important species or local First Nations (Crossroads 2015, Appendix 20-A of the Application). It is anticipated that TKN will participate in the permit review process as a member of the Mine Review Committee to be established by the MMPO and will have an oppurtunity to comment on management plans submitted as part of the application package. AuRico is also discussing additional TKN participation in development and implementation of EMPs as a part of ongoing IBA discussions. Crossroads. 2015. Tse Keh Nay Kemess Underground Project Traditional Knowledge and Land Use Study. Preparded on behalf of the Tse Keh Nay Alliance for AuRico Gold by Crossroads Cultural Resources Management Ltd. Smithers, British Columbia	4-Nov-16
TKN-	23-Nov-16	C.Coady,(R. Robitaille)	Wildlife and Habitat	The Proponent response is acknowledged and anticipated TKN participation in the permit review process and development and implementation of monitoring and management plans is also acknowledged.	The comment is noted.	21-Dec-16
TKN-159	26-Jun-16	C.Coady, EDI	Wildlife and Habitat	The Secondary Response paragraph states that "Once the initial response has been undertaken, possibly affected environmental receptors will be identified and protected, particularly surface waterbodies. If the spill cannot be handled by on-site trained personnel or on-site available spill response equipment, an external spill response contractor will be arranged to attend to the situation. A plan for cleanup and remediation will be developed by the relevant Environmental Manager in coordination with external consultants, if required." – This is reactive, not preventative. A fish and wildlife response plan should be developed prior to a spill occuring so that mine site personnel are prepared for various scenarios that could occur and potentially impact waterbodies/habitat where fish and wildlife are present. The ORAR runs across Attichika Creek which drains into Thutade Lake, a culturally important lake to the TKN. Measures to be prepared for a potential spill should be done ahead of a spill. Furthermore, TKN would appreciate being given the opportunity to comment on these plans once they are further refined/developed.	The Emergency Response Plan will be further developed in the Permitting process for the Project. AuRico continues its ongoing communication with TKN leadership regarding TKN participation in site monitoring during operations & closure. TKN members will be employed directly by AuRico for monitoring and reporting activities. TKN members will be members of the Environmental Management Committee that is expected to participate in development of EMPs (i.e. included as part of IBA).	5-Aug-16
TKN-159.1	10-Oct-16	C.Coady, EDI	Wildlife and Habitat	It is noted that TKN and AuRico will be in discussions regarding appropriate monitoring and management plans in relation to the KUG project and that TKN will play an active role in development and implementation of those plans as part of the permitting process, ahead of Mine construction. TKN involvement in the review and implementation of any monitoring or management plans should be part of the terms and conditions for an EA certificate.	It is anticipated that TKN will participate in the permit review process as a member of the Mine Review Committee to be established by the MMPO. In addition, TKN participation during the KUG permitting process is included in the IBA.	10-Nov-16
TKN-159.2	23-Nov-16	C.Coady, (R. Robitaille) EDI	Wildlife and Habitat	The Proponent response is acknowledged and anticipated TKN participation in the permit review process and development and implementation of monitoring and management plans is also acknowledged.	The comment is noted.	21-Dec-16
TKN-160	26-Jun-16	C.Coady, EDI	Wildlife and Habitat	This section states that flows in excess of what the treatment plants can handle (50 L/s for Se and 121 L/s for other metals) will bypass the treatment plants and go directly into Attichika Creek. Has water quality modeling for selenium accounted for these potential by-passes of the treatment plant? What is the potential frequency, duration or likelihood of these by-passes? What are the Proponent's plans for monitoring or adaptive management for when by-passes occur (i.e. monitoring of receiving environment levels of Se and adaptive management if selenium exceeds certain guidelines or thresholds).	As described in Section 3.5.1 of Appendix 11-D (Water Balance and Water Quality Modelling Report) of the Application, potential by-passes of the water treatment plant were included in the water quality model. Figure 1.3-8 of Appendix 11-D provides a visual comparison of the planned discharge rate from the KUG TSF and the treatment capacity of water treatment plants. Water quality modelling considered all inputs, both treated and untreated, when predicting concentrations of parameters at each modelling node in the various water bodies. Monitoring of discharge and water chemistry of the receiving environment will be required as part of an effluent permit under the Environmental Management Act and to meet obligations under the Metal Mining Effluent Regulation. The proponent has proposed a Fish and Aquatic Effects Monitoring Plan as part of the Application (Section 24.7), which will be further developed as part of the permitting process. Other management plans also propose monitoring of onsite chemistry (e.g., Section 24.11.5 under Mine Waste, Tailings, and ML/ARD Management Plan; 29.18.6 under Water Treatment Plan). Adaptive management is a component of the monitoring plans that will be developed during permitting but may include alteration of timing of discharge and increased water treatment capacity.	5-Aug-16
TKN-161	26-Jun-16	C. Mackay, EDI	Terrestrial Invertebrates	While surveys for a portion of the taxa were completed (dragonfly species), surveys for terrestrial invertebrates as a group were not completed. There is not sufficient sampling effort (i.e. none) to state "no species of concern were identified within the LSA" as a rationale for excluding the species group from the EA. Provide other rationale.	Other rationale also provided in Table 15.3-3 included: the majority of the Project occurs at high elevations, where butterfly, dragonfly and damselfly abundance and diversity are typically lower and appropriate habitat for terrestrial invertebrates is assessed in the Chapter 13, Terrestrial Ecology chapter. Additionally, appropriate terrestrial habitats have been captured as the assessment for migratory landbirds included all biogeoclimatic zones affected by the Project.	5-Aug-16
TKN-162	26-Jun-16	C. Mackay, EDI	Amphibians	Insufficient evidence is provided as rationale for not carrying forward the residual effect, disruption of movement, to the cumulative effects assessment. Please provide other rationale or carry this residual effect into the CEA.	Section 15.16.2 identifies that of the effects, disruption to movement is residual only from the water discharge line to Attichika Creek. This effect will only impede terrestrial movement, and will not affect breeding. Given the restricted range of western toad and the absence of overlapping developments in the LSA the residual effect was not carried into the CEA.	5-Aug-16
TKN-163	26-Jun-16	H. Van de Vosse, EDI	Accidents and Malfunctions	Significance of residual effects. Application states "There is a moderate to high level of confidence in the analyses." However, common themes present throughout the entire effects assessment within the Accidents and Malfunctions chapter would suggest otherwise. The assessment is high-level and lacks ecological context; baseline conditions for VCs have not been adequately brought forward from other chapters and the reviewer is constantly referencing back to these chapters to identify where critical/important habitat and/or features are located in relation to the potential effects. The assessment is subjective and provides very limited supporting rationale in the form of scientific literature and emperical evidence of actual occurrences of events from KS Mine Operations when discussing potential effects. For example, there is often no literature to support statements regarding VC resiliencies nor indication of appropriate timeframes of effects (what is considered short-term versus long-term). It is unclear if the effects assessments are based on inherent or residual risk as mitigation is buried within the assessment itself; proposed mitigation measures for those effects/events deemed to have "minor adverse effect" or "low overall risk" are not presented within the Application and therefore cannot be evaluated for its effectiveness. Contradictory logic is often used within the assessment making it difficult to follow rationale for effects assessment and determination of significance. For example, in the fuel spill to wetlands scenario it is mentioned that "the duration of the effect is anticipated to be short-term given the timely implementation of spill response procedures", yet in the same paragraph, it states "inherent difficulties with containment and recovery in wetlands due to limited access potential for removal of vegetation suggest that effects would be potentially reversible long-term". It will be critical to provide descriptive and detailed inspection and monitoring plans to address potential effects of identified accidents and malfunctions.	The comment is noted. Responses to the specific EA Information Requirements are provided to subsequent comments.	5-Aug-16
TKN-164	26-Jun-16	H. Van de Vosse, EDI	Accidents and Malfunctions	Data Input characterization and evaluation of Failure Mode and Effects Analysis relies heavily upon professional judgement and as such the resulting analyses appears to be highly subjective in 1) determining scenarios that represent the most signficiant and realistic risks (FMEA worksheet - Appendix 22-A), and 2) evaluation of environmental risks carried forward for those that were considered high- or moderate-risk levels. There is little to no supporting scientific evidence/literature or previous intances of occurrence drawn upon from operations either at KS Mine or other mines in the area regarding the likelihood of occurrence, or effectiveness of proposed mitigation. Yet within the Background section (22.1) of the A&M Chapter, the application states "many of the risks and uncertainites for the surficial aspects of the proposed KUG Project are well known through the operating history (1998 to 2011) of the KS Mine (pg 22-2)." It could then be reasonably expected that the FMEA would include empirical data in assessing these criteria. This is particulary important given the application states "the assessment and determination of significance [of residual effects] assumed that mitgiation procedures and response plans would be in place and effective." This information is necessary to adequately evaluate the subjective nature of the assessment and confirm "consistency, repeatability, and transparency in the methods" as stated in the Application (section 22.5.7) Action required: Provide supporting documentation regarding the likelihood of occurrence, preferrably based on empirical data of previous occurrences at KS Mine and/or other applicable operating mines in the area. Provide supporting documentation or literature describing the effectiveness of proposed mitigation.	As stated in Section 22.5.7, mining project incorporate a number of structures that represent combinations of natural and engineered systems involving geology, geotechnics, hydrogeology, hydrology, geochemistry, biology, ecology, and social systems. Due to the complexity of such engineered/natural systems, no statistics of equivalent system performance or probability analyses are available to precisely and mathematically determine the potential for failure events. Given the lack of any established databases, the judgement and experiences of suitably qualified and experienced professionals provides the "best estimate" of the consequence and, more importantly, the likelihood. This is the norm for many industrial, engineering, financial, economic, and social management systems that employ FMEA methodologies (Carbone and Tippett 2004). In most cases, as with this Application, the FMEA used a semi-quantitative method to estimate the likelihood and consequences of a risk event. Appropriate experts familiar with the design, operations, and site conditions assigned values for likelihood and consequence. The statement on page 22-2 "many of the risks and uncertainties for the surficial aspects of the proposed KUG Project are well known through the operating history (1998 to 2011) of the KS Mine" indicates the participants in the FMEA process who have first-hand knowledge of the operating conditions and potential for accidents and malfunctions are qualified to provide qualitative assessments of likelihood based on experience and the effectiveness of mitigation Carbone, T. A. and D. D. Tippett. 2004. Project risk management using the project risk FMEA. Engineering Management Journal, 16(4), 25-35.	5-Aug-16
TKN-164.1	10-Oct-16	H. Van de Vosse, EDI	Accidents and Malfunctions	As the Application stands, the reviewer must rely on the judgement and expertise of the FMEA team in the qualitative assessment which creates the appearance of subjectivity. Documentation of previous instances of occurence from Kemess South or other operating mines would provide the reviewer with additional information on which to base technical review of the material presented in the Application. This includes a review of likelihood and consequence and effectiveness of mitigation, reducing assessment subjectivity and imparting increased confidence in the conclusions. Given the reduced confidence in the assessment, it will be requested that the Proponent provide descriptive and detailed management and monitoring plans to address potential effects of accidents and malfunctions.TKN should be granted a meaningful opportunity to be involved in development of these plans, and to also have an active role in monitoring (including being promptly provided with copies of monitoring reports).	Environmental Management Plans, including the Emergency Response Plan, will be further developed in the Permitting process for the Project. TKN participation during the KUG permitting process is included in the IBA. TKN members will be members of the Environmental Management Committee that is expected to participate in development of EMPs (i.e. included as part of IBA).	28-Oct-16
TKN-164.2	23-Nov-16	H. Van de Vosse, EDI	Accidents and Malfunctions	The Proponent response is acknowledged and anticipated TKN participation in the permit review process and development and implementation of monitoring and management plans is also acknowledged.	The comment is noted.	21-Dec-16

Kemess Underground Application Review - TKN Issues Tracking Table - January 6, 2017

	For Working Group Use				For Proponent Use	
ID #	**Comment Date**	**Reviewer Name / Agency (i.e. Alex Kwang, MEM)**	**Subject (See "instructions" tab)**	**Comment (Include Memo reference as applicable)**	**Proponent Response (Include Memo reference as applicable)**	**Response Date**
TKN-165	26-Jun-16	H. Van de Vosse, EDI	Accidents and Malfunctions	Current definitions used to categorize consequence criteria for environmental effects use qualifying language such as limited, minor, moderate, serious and severe. Reviewer is unclear on how these categories are defined or evaluated. For example, if a potential effect will influence multiple VC's was a higher consequence criteria selected? How are temporal or geographic scales of the effect represented within the consequence criteria, as a longer-term effect would be considered a higher consequence. Vagueness of criteria has reduced reviewer confidence in overall risk ranking of potential events since it allows for introduction of subjective interpretation among contributors in developing the FMEA worksheet upon which overall risk ranking was developed and forms the basis of the effects assessment of this Chapter. For example, off-spec discharge of the Se-IX treatment plant was identified as a likely occurrence with low environmental consequence and low overall risk level/rank. Action required: Provide clarification regarding how limited, minor, moderate, serious, and severe consequence criteria were defined or evaluated during development of the FMEA such that confidence in overall risk ranking would be improved.	Consequence definitions used in the FMEA are shown in Table 22.5-3 of the Application. For the example of off-spec discharge from the Se-IX treatment plant, the expectation is that with standard operational and contingency measures as well as monitoring programs in place any off-spec discharge would be of limited duration and most likely be of relatively low magnitude. This would be reportable to regulators, could lead to some potential delays in discharge of water from the KUG TSF, and have minor environmental effects consistent with low environmental consequence rating in Table 22.5-3.	5-Aug-16
TKN-165.1	10-Oct-16	H. Van de Vosse, EDI	Accidents and Malfunctions	Further clarification is needed as it is not intuitive to the reader how these categories were derived and what supporting information was used to classify events within these categories. Continuing with the Se-IX example, the Proponent indicates effects were characterized based on duration, magnitude and an assessment of environmental effects. These are methods that were employed in Effects Assessments (section 22.7) and not within the initial identification of environmental consequence as listed in Table 22.5-3. This particular example was not carried forward into the Effect Assessment in section 22.7. Following this rationale, it would seem that an effect assessment is needed to derive the overall risk ranking. Was the process identified in the SE-IX example carried forward for all risks identified in the FMEA worksheet	The risk rankings were develop based on the consequence (Table 22.5-3) as well as likelihood (Table 22.5-4) of an event as identified by contributors to the FMEA. This initial assessment was done at a preliminary or screening level and relies upon the proffesional judgement of the contributors to the FMEA (Table 22.5-1), this was done for all risks identified in the FMEA worksheet. The matrix in Table 22.6-3 shows that based on the potential consequence, events were screened out that had low risk (likelihood x consequence). Those not screened out (moderate or high risk) were reviewed in greater detail. Contributors to the FMEA then reviewed those moderate and high failure modes with respect to: the likelihood of the event (already identified), the potential location of the failure, the environmental values present at potential event sites, and the potential effects on those values given the identified mitigation measures in Table 22.6-6. Based on the probability of the event, effectiveness of mitigation, and the environmental values at risk and potential effects, some events were identified with negligible to minor risk which were not carried further in the assessment (this conforms with the methodology of the assessment where low risk events were not assessed further; Section 22.6.2.1). If we follow the Se-IX example: it was ranked as Low Risk (L19) for which likelihood was likely (defined as could occur at some time) and consequence was low (defined as minor on-site environmental effect(s), reportable to regulators, potential delays). Specific to off-spec discharge from the Se-IX plant, the environmental effect would be localized in terms of the extent, occurring at a single discharge point but dispersing and diluting downstream. The duration of the event would be limited as performance monitoring of treatment plant would be continuous, allowing for corrective actions to be implemented in a timely matter, and the effect to the environment would be quickly reversible once issue correct or discharge suspended. A one-time short-term release of water with elevated concentrations of Se would not be expected to lead to chronic effects and relevant VCs (fish and other aquatic biota) are resilient to short-term exposures. For these reasons, it was identified as a low risk failure mode and not assessed further. While the formal assessment of all 156 low environmental risk failure modes was not detailed in the assessment, potential effects were reviewed within the context of environmental assessment procedures by the contributors to the FMEA and similar considerations to those above for the Se-IX example were made for each of the risks identified in the worksheet.	28-Oct-16
TKN-166	26-Jun-16	H. Van de Vosse, EDI	Accidents and Malfunctions	Only those events with a moderate or high overall risk category (those within yellow and red categories in Table 22.6.3) were carried forward to a formal risk assessment as conducted in the Application. While a number of events were identified as likely to occur or of rare occurrence with moderate environmental consequences (i.e. Low Overall Risk Ranking), these events were excluded from the formal risk assessment without a clear discussion of proposed mitigation measures that will be implemented. [Mitigation measures are only presented in the associated appendix (Appendix 22-A) with no discussion regarding effectiveness.] As such the full effects of these events were not determined (i.e., how is risk of events that are likely to occur adequately identified or addressed if the events aren't carried forward), resulting in potential inadequate characterization or evaluation of environmental risk. This is particularly important as the FMEA didn't appear to account for geographic/spatial extents, involvement of multiple pathways/VC/indicators, nor ecological context when evaluating environmental consequence. At the very least, the reviewer expected to see discussion of detail surrounding these events and proposed mitigation that will be used. Instead it was left to the reviewer to identify from Appendix 22A which events these ratings referred to. Of these 5 events, two are related to off-spec effluent discharge from the water treatment plants. Given that water quality guidelines will be exceeded during these events and changes in water quality influence multiple VCs and pathways for indicators (e.g., fish tissue concentrations already exceed thresholds), more discussion on these particular events should be provided within the Application. In addition, a single event has been identified as expected (BXL sediment pond water release) with negligible consequence, yet no information detailing when or how this is expected to occur, what defines the event as negligible, nor information regarding implemented mitigation measures or monitoring requirements are discussed. While the reviewer recognizes that not all events can or should be explicitly detailed within the chapter or carried forward in the effects assessment, those events that have been identfied as likely to occur (with low consequence) or have moderate environmental consequence should be carried forward through the effects assessment to adequately characterize environmental risk and provide a measure of transparency and further discussion as applicable. Action required: Conduct an effects assessment on the 5 events identified as having Likely occurrence with Low Consequence within Table 22.6-3. Provide additional details surrounding the 18 events categorized as Rare Likelihood and Moderate Consequence (Table 22.6-3) and include a discussion on mitigation measures.	AuRico considers several statements in the reviewer comment are incorrect. The geographic/spatial extents of VCs were taken into account for the FMEA; where an event had identifiable spatial extent, this was used to assess the potential interaction with the event identified in Table 22.7-1. The VC baseline mapping was used to identify potential spatial interactions with failure events. The FMEA also considered ecological context (definition in Table 22.7-2 and assessment in Table 22.7-4) when evaluating environmental consequence. While the probability of some events was characterized as likely, the consequence of these was identified as negligible or low. No likely events with moderate consequences were excluded from consideration. Mitigation and detailed assessment, in a risk based environment, is focused on moderate or high risk events that require additional management or mitigation measures identified to reduce risk to acceptable levels. Events with negligible or low environmental consequences, or rare likelihood that are low risk, do not require development of additional mitigation beyond the mitigation measures already identified in the FMEA (Table 22.6-3). This was the rationale behind these events only being included in Appendix 22-A. As stated in the text, the assessment of risk assumed that general mitigation procedures and response plans would be in place and effective (Section 22.3). AuRico does not believe additional assessment is required for events assessed as low risk.	5-Aug-16
TKN-166.1	10-Oct-16	H. Van de Vosse, EDI	Accidents and Malfunctions	Granted geographical/spatial extents may have been considered within the FMEA analyses based on vague language defining environmental consequence. However, it is not intuitive to the reviewer how this was applied to all identified risks within development of the FMEA worksheet (refer to comment TKN-165 in which further clarification of environmental consequence was requested). Based on the structure of the EA Application and step-wise description of analyses, it would appear that ecological context of VCs (i.e., description of how the event may impact the VCs) has been applied only to those risk events that were carried forward into the effects assessment in section 22.7. If this is not the case, please direct the reviewer to the section within the Application that clearly states where and how this item was also considered during identification of risk and development of risk rankings within sections 22.5 and 22.6. This process of risk assessment may not fully identify or evalute effects of events not carried forward (for example, events deemed Likely to Occur with Low Environmental Consequence). Regarding the 5 events identified in the Application as Likely to Occur with Low Environmental Consequence and the 18 events rated as Rare with Moderate Environmental Consequence, both of which were not carried forward into the effects assessment, there are several additional factors that contribute to reviewers low confidence in determination of residual effects: 1) no data on previous occurrences at KS have been provided to support accurate characterization of likelihood nor evaluation of effectiveness of mitigation [evalution of mitigation measures was directly incorporated into other chapters in the EA Application - section 15.5.3.3]; 2) Application "assumed that mitigation procedures and response plans would be in place and effective" (section 22.3); and 3) these mitigation measures which are presented in Appendix 22A are high level, referencing development of management and response plans while providing little to no detail on specific mitigation measures. Action Recommended: The Proponent should develop descriptive and detailed management and monitoring plans to address potential effects of these identified occurrences. This should be a requirement/condition of the EA certificate. TKN should be granted a meaningful opportunity to be involved in developing these plans, and to also have an active role in monitoring (including being promptly provided with copies of monitoring reports).	Environmental Management and Monitoring Plans, including the Emergency Response Plan, will be further developed in the permitting process for the Project. It is anticipated that TKN will participate in the permit review process as a member of the Mine Review Committee to be established by the MMPO. In addition, TKN participation during the KUG permitting process is included in the IBA and TKN will become members of the Environmental Management Committee that is expected to participate in development of EMPs (i.e. included as part of IBA).	10-Nov-16
TKN-167	26-Jun-16	H. Van de Vosse, EDI	Accidents and Malfunctions	Moderate environmental risks scoped out of the effects assessment. Application states that the assessment excludes a particular failure mode (sediment release into watercourse or erosion) because infrastructure is part of the existing KS infrastructure, not KUG. Reviewer infers then that all exisiting KS infrastructure has been scoped out of the effects assessment whether is it to be utilized within KUG or not. Please confirm that this is the intended context. Further, has existing infrastructure to be used by KUG been included within the effects assessment? If not, please provide specific rationale as to why existing infrastructure that will be used by KUG has been excluded.	The existing KS infrastructure that will be used for the KUG project was included in the Accidents and Malfunctions assessment. Only those features that were required specifically for KS regardless of KUG were excluded from the Accidents and Malfunctions assessment. For example, the rationale for excluding the Selenium Collection Pond water release is because KUG will not be influencing the runoff collected in the pond or the amount of metals loading to the pond. Once water from the Se Collection Pond is placed in the KUG TSF, then accidents and malfunctions related to this are covered under failure scenarios related to the KUG TSF and KUG TSF discharge.	5-Aug-16
TKN-168	26-Jun-16	H. Van de Vosse, EDI	Accidents and Malfunctions	Follow-up monitoring for leak/spill of hazardous substances stored on-site. Bullet identifies that enhanced soil and groundwater monitoring procedures will be implemented to assess requirement for additional clean up depending on scale of the spill. Reviewer could not find reference to this within the Spill Response Plan. Please clarify/confirm that this information will be detailed within the finalized Spill Response Plan including specific monitoring requirements tied to identified scales of spills.	Enhanced monitoring will include increased monitoring frequency to document the success of the mitigation. The use of enhanced monitoring or a change in monitoring parameters to identify effects and provided feedback to management and mitigation measures will be identified by a qualified professional at the time of the accident or malfunction. This will ensure that changes in monitoring are responsive to unique site conditions, size of spill, and substance involved. The need for development of enhanced follow-up monitoring in the event of the spill will be included in the Spill Response Plan developed to support the permitting process.	5-Aug-16
TKN-169	26-Jun-16	H. Van de Vosse, EDI	Accidents and Malfunctions	KUG TSF East Dam or pit wall overtopping - preventative procedures. In March 2015, TetraTech requested review of freeboard requirements for all stages of the project to address revisions to the water management strategy to include treatment during operations which increases the depth of the supernatant pond in early operations. This revision could have implications on TSF capacities and effects on wave generation and potential overtopping of the East Dam as a result of pit wall failure. AMEC Foster Wheeler agreed with the need for clarification/review. However, it is unclear to the reviewer if the 0.5m freeboard referenced in the table represents the reviewed height as suggested in previously mentioned dialogue.	The addition of water treatment to the KUG TSF design affords flexibility in the timeline of pit dewatering, such that the pond volume is larger during the early years of operation. However, by the time the East Dam is constructed, the pit has been significantly dewatered, and pond volumes are similar to those assumed in the Knight Piesold 2011 report which predicted a maximum wave run-up of 0.6 m at the beach due to a hypothetical pit wall failure. Therefore, the 1.0 m assumed for freeboard to account for wave run-up (in addition to the 1.5 m required to accommodate the PMF) is sufficient at a feasibility level design. The freeboard assumed for wave run-up will be reviewed during the detailed design phase.	5-Aug-16
TKN-170	26-Jun-16	H. Van de Vosse, EDI	Accidents and Malfunctions	Please clarify how severity of effect (negligible, minor, moderate, major) was defined during identification of potential interactions between Failure Modes and Valued Components and provide rationale as to why these catergories are not consistent with the effects assessment approach used earlier (i.e., within VC chapters) in the Application.	The potential interaction between failure modes and VCs used in Table 22.7-1 is defined in Section 22.7.1 The four class system, compared to the three class system in the VC chapters, was used to acknowledgement of potential interactions that are expected to be limited to minor effects and thus not the focus of the accidents and malfunctions assessment.	5-Aug-16
TKN-170.1	10-Oct-16	H. Van de Vosse, EDI	Accidents and Malfunctions	That effects are "expected" to be limited to minor effects as indicated in Table 22.7-1, which suggests that residual effects on VC's are present following the implementation of mitigation measures identified in Table 22.6-6 and as per response to comment TKN-173. If this is accurate, then an effects assessment should have been conducted to fully assess implications on those events identified as having a minor effect.	The assessment completed in Chapter 22 of the Application is focused on accidents and malfunctions, and corresponding enivornmental interactions that could be potentially significant in nature. It is noted that Table 22.7-1 refers to "expected" interactions only if an accident of malfunction event occured; accidents and malfunctions are not expected to occur during the course of routine operations. AuRico feels that screening out potential interactions of potential accidents and malfunctions that were qualitatively considered to be negligible or minor nature is a reasonable approach to focus the assessment. It is noted that this additional screening step did not result in exclusion of any moderate or high risk modes and events from further assessment; it was used to limit to the number of VCs considered in the subsequent effects assessment. Additional qualitative assessment could be completed but this is not expected to result in identification of any new preventiative, mitigation, or management measures, or in any additional significant adverse effects, and thus is not considered to be warranted.	4-Nov-16
TKN-170.2	23-Nov-16	H. Van de Vosse, EDI	Accidents and Malfunctions	Monitoring and management plans should address not only moderate and high risk events but also low risk (i.e. those with an expected interaction).	The comment is noted.	21-Dec-16
TKN-171	26-Jun-16	H. Van de Vosse, EDI	Accidents and Malfunctions	Red and/or blue listed ecyosystems within the Leak/spill during transport is missing interaction symbology	The potential interaction between leak/spill during transport with listed ecosystems should be indicated as negligible	5-Aug-16

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TKN-172	26-Jun-16	H. Van de Vosse, EDI	Accidents and Malfunctions	Regarding effects related to fire, the extent of the worst case scenario is unclear. It is assumed that Application refers to a wide-spread forest fire as the worst case scenario since "control measures in the in the Emergency Response Plan would help reduce the potential for fire spread." This could be infered that measures will not contain the fire resulting in the potential for wildfire to spread beyond the vicinity of the transportation crash. An Intergovenermental Panel on Climate Change in 2007 identified the the frequnecy and severity of wildfire will increase in coming decades as a result of climate change (K.D. Bladon and T. Redding). In addition, given recent fire events within the Boreal Forest and remoteness of the mine site and transportation routes, a larger-scale fire could be considered as reasonably-foreseable event. therefore it should be considered as worst case and assessed as such within the Application. Effects of fire on soils, water quality and quantity, and wildlife are well documented in literature (see references below) yet in the Application are considered to have no interaction or minor adverse effects. Similarly, no interactions between wildlife and fires have been identified yet forested ecosystems (indirect effect to wildlife through degradation of habitat or habitat loss) have been assigned a moderate potential effect. Bladon, K.D. and T. Redding. 2009. Wildlife and watershed hydrology: key findings from a workshop. Streamline: Watershed Management Bulletin. Vol 13 No 1. Curran, M., B. Chapman, G. Hope, D. Scott. 2006. Large-scale Erosion and Flooding after Wildfires: Understanding the soil conditions. Ministry of Forests Technical Report 030 Neary, D.G., K.C. Ryan, L.F. DeBano. Wildland fire in ecosystems: Effects of fire on soil and water. US Department of Agriculture, Forest Service, Rocky Mountain Research Station, Ogden UT. General Technical Report RMRS-GTR-42, Vol. 4 Action required: Provide rationale and supporting documentation as to why failure mode for fires and explosions: 1) excluded or discounted potential interactions on surface water quality and quantity, 2) have been assigned minor effects on soil quality, and 3) have no predicted interactions on wildlife VCs. Alternatively consider re-assessing the failure mode using a larger-scale wildfire as a worst case scenario incorporating these potential interactions.	Fires caused by a Project related accident or malfunction were considered to be controllable given the rapid response and control measures implemented to prevent accidents. The mitigation measures identified in Chapter 23 – Effects of the Environment on the Project will be implemented and are effective for providing rapid wildfire suppression in the event of a fire ignition. These include: o training for designated permanent employees (e.g., Provincial S100 Basic Fire Suppression and Safety training) and ensuring sufficient trained personnel are on site during the fire season to initiate a fire response; o ensuring employees have access to appropriate personal protective gear to action a wildfire response; o ensuring water sources have adequate volumes to fight fires and that pumps or other water delivery systems can provide sufficient pressure for the effective use of hoses, sprinklers, and other fire suppression tools; o locating water pumps and fire-fighting equipment strategically around the Project to help contain/extinguish any fire; o equipping a vehicle with firefighting tools (shovels, pulaskis, and axes), water, and portable pumps to supply initial attack to accessible fires; o using mining equipment such as dozers in the case of a fire to remove vegetation around the infrastructure, thus removing fuel for the fire; o providing backup generators for use in the event of power line loss. The generators will have enough power capacity to operate essential equipment (e.g., ventilation, fire suppression); o training personnel in fire response and containment, including using fire extinguishers for small fires in buildings and raising an alarm and seeking assistance; o monitoring BC Ministry of Forests, Lands and Natural Resource Operations (BC FLNRO) fire alerts; and o complying with all relevant legislation in the BC Wildfire Act (2004). Given the implementation of these mitigation measures and the rapid response of Wildfire Management Branch because of the values at risk in the area, suppression control was assessed as capable of stopping fire spread beyond the immediate accident scene. Effects to VCs were assumed to be limited to a limited area around the accident and therefore no interactions are anticipated for most VCs.	5-Aug-16
TKN-172.1	10-Oct-16	H. Van de Vosse, EDI	Accidents and Malfunctions	Mitigation and rationale acknowledged. Please confirm the geographic extent to which these identified measures will be applicable. Is the referenced mitigation limited to the Project footprint (i.e., mine site and mine site roads) or will it include the full extent of the ORAR and other transportation routes?	The mitigation measures identified in response to TKN-172 apply to the location of the Project-related accident, which could extend beyond the boundaries of the Project footprint (ie - along the ORAR).	28-Oct-16
TKN-172.2	23-Nov-16	H. Van de Vosse, EDI	Accidents and Malfunctions	The most effective mitigation measures identified in AuRico's response to comment TKN 172 are not feasible measures along the extent of the ORAR or even within the 168 km where AuRico is the sole industrial user. Mitigation measures such as: "access to appropriate personal protective gear to action a wildfire response; ensuring water sources have adequate volumes to fight fires and that pumps or other water delivery systems can provide sufficient pressure for the effective use of hoses, sprinklers, and other fire suppression tools; locating water pumps and fire-fighting equipment strategically around the Project to help contain/extinguish any fire" are assumed to not be implemented for fires along the ORAR. A detailed plan on how a fire along the ORAR will be mitigated needs to be developed.	The comment is noted.	21-Dec-16
TKN-173	26-Jun-16	H. Van de Vosse, EDI	Accidents and Malfunctions	Reviewer has significant concerns regarding the approach to identifying and categorizing potential risk of effects on VCs for identified failure modes within the effects assessment. Approach does not appear to be based on identification and evaluation of residual effects. Mitigation measures are only brought forward in the effects assessment itself. Meaning there are identified interactions (those in Table 22.7-1 identified as having either a negligible or minor effect) that appear to have been discounted based on a subjective evaluation of risk rather than being based on scientific literature and known effectiveness of mitigation measures. Only those VC interactions with a moderate or major risk category (those within yellow and red categories in Table 22.7-1) (again arbitrary categorization, rather than residual effects based) were carried forward to a formal risk assessment as conducted in the Application. Therefore, the full effects of these events may not have been adequately determined or assessed, resulting in potential inadequate characterization or evaluation of environmental risk. This is particularly important as the identification of potential interactions didn't appear to account for geographic/spatial extents, involvement of multiple pathways/indicators, nor ecological context when evaluating potential interactions. Action required: Mitigation measures need to be clearly identified and described addressing all identified interactions prior to the effects assessment. If potential interactions have been identified that cannot be addressed through mitigation (i.e., are residual), then they should be carried forward through the effects assessment to adequately characterize environmental risk and provide a measure of transparency and further discussion as applicable.	The Chapter does address residual risk which is the risk remaining after the application of controls. The assessment of risk assumed that general mitigation procedures and response plans would be in place and effective. These in-place mitigation were included in the completed FMEA table and used to identify the residual risk of each event. The controls, management, and monitoring plans associated with low environmental risk events are listed in Appendix 22-A of the Application. The FMEA identified moderate and high risk events which are shown in Tables 22.6-4 and 22.6-5. Additional mitigation measures for these events were described in Table 22.6-6. After application of these mitigation measures, temporal or spatial interactions between events and VCs was identified (Table 22.7-1). Where and interaction between an event and VC was identified as having moderate or high potential to occur, it was carried through into the assessment (Table 22.7-3). The residual risk and significance for each VC was assessed by each moderate or high event that interacted with a VC (Table 22.7-4).These were described in greater detail in section 22.7.	5-Aug-16
TKN-173.1	10-Oct-16	H. Van de Vosse, EDI	Accidents and Malfunctions	Chapter is not intuitive in discussing residual effects and mitigation measures. It would have been advantageous to present the chapter using format similar to other effects assesssments to fully gain an appreciation of mitigation and its effectiveness. For example, chapter 15.5. identifies and describes potential effects or interactions with wildlife, then discusses mitigation measures including an evaluation of mitigation effectiveness, and clearly identifies whether a potential residual effect is present. No further action is required.	AuRico ackowledges the comment.	28-Oct-16
TKN-174	26-Jun-16	H. Van de Vosse, EDI	Accidents and Malfunctions	Dam breach and inundation study for KUG TSF has not yet been completed. Therefore assessment of the East Dam failure scenario is based on the dam breach and inundation study for KS. The Application anticipates that effects of an East Dam failure will be smaller in extent than the KS TSF failure (KUG TSF is smaller than KS TSF) and will be limited to Kemess and Attichika creeks and Thutade Lake. Tailings would be anticipated to deposit within the floodplain of Attichika creek and the "substantial size and volume of Thutade Lake would act as a sediment trap and flow buffer, limiting the impact of the breach farther down the Finlay River." Please confirm: 1) a dam breach and inundation study will be conducted for the KUG TSF and 2) the effects assessment would be reconsidered or revisited should the upcoming dam breach and inundation study for the KUG TSF indicate changes to the anticipated extent of an East Dam failure.	During the permitting process of the Project, a dam breach inundation study will be conducted for the KUG TSF and the Accidents and Malfunctions effects assessment will be reconsidered or revisited should the upcoming dam breach and inundation study for the KUG TSF indicate discrepancies in the anticipated extent of an East Dam failure identified in the Application.	5-Aug-16
TKN-175	26-Jun-16	H. Van de Vosse, EDI	Accidents and Malfunctions	Within the East Dam failure scenario, effects on wildlife (with the exception of western toads) were determined to be non-significant. Reviewer found statements within the assessment to be contradictory which may lead to an inaccurate representation of significance of effect. Assessment characterised effects as being moderate magnitude (yet considerable changes in habitat from current baseline conditions would be anticipated indicating high magnitude). As well the effect has been identified as occuring with medium duration yet effects are considered reversible in the long-term. Effects through degradation or loss of habitat (i.e. changes in terrestrial ecology) were considered reversible in the short-term within the text in this section. However, this result is contradictory to the results of the assessment on terrestrial ecology (forested and wetland ecosystems providing wildlife habitat) which state significant impact of effects is expected through changes in plant communities (species, abundance and potential contamination through uptake of metals) and sedimentation and were considered to be long-term duration with low to moderate resiliency. This percevied discrepancy diminishes confidence in the effects assessment of this chapter.	It is acknowledged that considerable changes would occur to habitat directly impacted by a dam failure scenario, this is why magnitude of effect on terrestrial ecosystems likely to be directly impacted is rated as high. The moderate rating specific to wildlife recognizes that for most species of species groups that the directly affected habitat would represent a portion of available habitat in the local and regional study areas. The effect would be considered to have a higher magnitude for species that have smaller home ranges and less mobile, which is why magnititude of western toad was rated as high. Within the text it is also acknowledged that a higher rating would be applicable to waterbirds and migratory birds if the event occurred during the breeding season. The duration of effect was rated as medium, which is defined as 6 to 25 years, and reversible in long term which is defined as reversible after "many years". The duration of effect on terrestrial ecosystems was rated as long (between 26 to 50 years) to reflect the full duration for several of the ecosystems to fully recover to an undisturbed state. However, it is expected that affected areas would provide some level of habitat prior to full recovery, thus supporting a short duration effect on wildlife. Text within section 22.7.7 should have indicated long-term reversibility of indirect effects on wildlife consistent with Table 22.7-4. This revision does not influence the overall conclusions of the assessment.	5-Aug-16
TKN-175.1	10-Oct-16	H. Van de Vosse, EDI	Accidents and Malfunctions	Response recognizes directly affected habitat represents local and regional study areas, with consideration to home range sizes and critical timing windows. While the Application provides definitions of Significant and Non-signficant events, it also states that these definitions are meant to provide general guidance and different combinations of criteria have been used in determining signficance (section 8.5.4). Results of wildlife suitability models indicate Kemess Creek and Attichika Creek (areas directly and heavily impacted by a potential dam breach) provide significant high quality late winter habitat for moose, which appears to be restricted to these riparian areas in the LSA. Long-term habitat loss resulting from a dam breach could have serious implications on local distribution and habitat quality. Kemess Creek and Attichika creek also provide moderate to moderate-high suitability for grizzly bear in the spring. Collared caribou have been identified in the areas potentially affected by a dam failure and suitability models suggest low to moderate quality habitat for summer use and spring calving. Given the potential implications of various species of wildlife populations over the long term, it would seem a that a more conservative approach in the effects assessment would consider these effects to be significant. Action Recommended: Given the information discussed above, please provide further information on why a dam breach would not be a significant event for wildlife that have high quality habitat in the potentially dam breach affected areas. The rationale provided in the Proponent's response is not adequate.	The assessment that has been completed required subjective decisions based on AuRico and ERM's experience. It is acknowledged that a determination of significant effect (as was identified for surface hydrology, surface water quality, wetland ecosystems, forrested ecosystems, fish, and western toad) to other wildlife species and groups would also be considered reasonable. A determination of significance specific to additional wildlife species or groups would not influence the planning or design of the KUG TSF or East Dam; reducing the risks associated with potenital failure of the East Dam has been a focus of AuRico project planning and design. In the unlikely event of a failure, a follow-up environmental assessment would be completed with appropriate remediation and mitigation measures implemented consistent with the realized effects (Table 22.6-6).	4-Nov-16
TKN-175.2	23-Nov-16	H. Van de Vosse, EDI	Accidents and Malfunctions	Acknowledged that a determination of significance would not specifically influence the planning or design of the KUG TSF or East Dam. However, determination of non-significant is not acceptable in the opinion of the reviewer.	Comment noted, no further response required.	21-Dec-16
TKN-176	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	p.2-2 Methods state that modeling was completed for LSA but sentence states "The WHRs were ...for each ecosystem unit found within the RSA." Baseline document shows TEM only done within the LSA. Please clarify that this is an error in the text.	The comment is noted, there was an error in this statement. Habitat suitability modelling was only conducted in the LSA.	5-Aug-16
TKN-177	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The Proponent should expand on the comment that the "Traditional Use Study (Crossroads 2015) provided some additional information" and state what this additional information was. It is important that available traditional knowledge identified in the Traditional Land Use Study (Appendix 20-A) be incorporated into baseline information.	The TLUS report provided information on traditional use of wildlife species in the larger area which surrounds the Project site. The interest in particular species displayed in the TLUS report was one of the factors in which species were chosen as wildlife VCs for the Application/EIS. The TKN were consulted with multiple times during the AIR and VC scoping sections. In many cases, respondents in community consultation sessions identified the same species and were noted in the VC selection section of the Application/EIS. For instance the TLUS report noted that caribou were important to First Nations in the Kemess Area (p. 10-1 of Appendix 15-A) and this species was includes as a VEC in the assessment. In addition, further information about the use of wildlife for traditional purposes (e.g. hunting, country foods) is addressed in other EA chapters, and that this was also informed by the TLUS report.	5-Aug-16
TKN-178	26-Jun-16	C.Coady, EDI	Wildlife and Habitat	Has the current TLUS (Appendix 20-A) been used to support the background information for all relevant wildife species? For example, in the moose background information section (15.4.3.2) there is no mention of recent interviews with TKN members regarding the traditional moose harvest in the KUG Project area. There is only mention of incidental moose information gathered from trapline holders from 1995-2006.	The information presented in Appendix 20-A in relation to relevant wildlife species included in the environmental assessment was reviewed. Pertinent pieces of information from First Nations were included to support baseline information presented, such as hunting areas for caribou (p. 15-31), mountain goat (p. 15-48), and hoary marmot (p. 15-67), and concerns raised by First Nations regarding the health of wildlife populations in the RSA (e.g., p. 15-31) and the declining populations of wildlife (p. 15-323). First Nations concerned over declining wildlife populations, and other issues related to resource development, were used to inform the cumulative effects assessment (p. 15-323).	5-Aug-16
TKN-179	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Baseline data collection has not been clearly presented in the baseline report. For example, Aerial survey text states that aerial surveys were completed in 2003, 2004, 2005 and 2015, and that calving survey was done in 2007 but in the legend for Figure 11.8-6 (aerial survey observations) under survey year shows additional years of 2006 and 2014. Please clarify this discrepancy.	This discrepancy was caused by a GIS mapping error within the legend of this map. The correct dates, inclusive of month and day, for all aerial surveys are provided in a memo **20160805 KUG Comment TKN 182 and 183_Caribou_Memo.**	5-Aug-16
TKN-180	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Baseline data collection has not been clearly presented in the baseline report. For example, ground survey texts states that ground surveys were completed in 2003, 2004, 2005 but in the legend for Figure 11.8-7 (ground survey observations) under survey year shows 2003, 2004, 2005, 2006, 2007, and 2014. Please clarify this discrepancy.	This discrepancy was caused by a GIS mapping error within the legend of this map. The correct dates for ground surveys that correspond to the data shown on Figure 11.8-7 are: September 3, 4, 11 - 16 (fall) and December 15 - 17 (winter) in 2003; February 16 - 18 (winter) and June 4 -5 (spring) in 2004; February 8 - 10 (early winter), April 11 - 15 (later winter) and May 24, 29, 30, 31 and June 1 (spring) in 2005; and May 30, 31 and June 1, 2, 3, 8, 9, 10 (spring) in 2007. Surveys carried out in the fall of 2003 were carried out as part of field wildlife habitat assessments conducted for habitat capability mapping (p. 11-5 of Appendix 15-A) and surveys carried out in spring of 2007 were carried out as part of studies of caribou calving habitat in conjunction with aerial surveys conducted at that time (3rd paragraph on p. 11-7 of Appendix 15-A).	5-Aug-16
TKN-181	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Baseline data collection has not been clearly presented in the baseline report. To provide more clarity, the proponent should provide the dates that aerial surveys were completed instead of statements like between February and July 2004. Should specify how many aerial surveys were flown.	The correct dates, inclusive of month and day, for all aerial surveys are provided in a memo **20160805 KUG Comment TKN 182 and 183_Caribou_Memo.**	5-Aug-16
TKN-182	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Baseline data collection has not been clearly presented in the baseline report. For example, Section 11.6.1.2 states that aerial surveys were done February to July 2004 and winter and spring 2005 but in this section there is no mention of the 2004 survey but does provide months for the 2005 survey and there is no mention of the 2007 and 2015 aerial surveys. Because of multiple years and multiple surveys, it is recommended that a survey summary table be provided to help clarify when, where and what type of survey was completed and the information in this table should correspond with information in associated result figures.	See memo **20160805 KUG Comment TKN 182 and 183_Caribou_Memo.**	5-Aug-16
TKN-183	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Baseline data collection has not been clearly presented in the baseline report. For example, a summary table showing how many caribou were observed during each aerial surveys would be helpful.	See memo **20160805 KUG Comment TKN 182 and 183_Caribou_Memo.**	5-Aug-16
TKN-184	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The Proponent should explain rationale for Fisher being excluded from effects assessment. Fisher is a Blue listed species in BC and Appendix 15-A says the presence of fisher in the LSA was confirmed. Fisher does not appear in any of the tables and should at least be included in Table 15.3-3 Wildlife excluded from the Application.	Fisher was not raised as a potential VC or indicator during development of the VC Scoping Summary (ERM 2014) or the AIR (EAO 2015), thus was not included in the EA. The LSA is predominantly Boreal Altai Fescue Alpine (BAFA) and Spruce-Willow-Birch (SWB) biogeoclimatic zones. As such trees are unlikely to achieve a size suitable for maternal denning in the LSA. This is the key habitat associated with limiting value to fisher. While it is acknowledged that fisher can exploit a greater variety of vegetation communities during their day to day activities, living habitat can be equated with marten habitat.	5-Aug-16
TKN-185	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The Proponent should clarify that the wildlife capability modeling LSA was only done on 16,626 ha of the LSA. Should provide an explanation on the approximately 32 ha difference between the two LSAs.	The LSA was altered between initial baseline and the application. The difference in area reflects these design changes.	5-Aug-16
TKN-185.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	This rationale should have been included in the Application. No further action required.	Comment acknowledged.	4-Nov-16

Kemess Underground Application Review - TKN Issues Tracking Table - January 6, 2017

	For Working Group Use				For Proponent Use	
ID #	Comment Date	Reviewer Name / Agency (i.e. Alex Kwang, MEM)	Subject (See "instructions" tab)	Comment (Include Memo reference as applicable)	Proponent Response (Include Memo reference as applicable)	Response Date
TKN-186	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Please include some text which shows what BEC subzones are found in the RSA because there is the possiblity of the RSA also containing ESSFmv4 and BWBSdk.	The BEC zones that are present in the RSA are provided in Table 15.7-1 (within Section 15.7 Cumulative Effects Assessment) and are as follows: BAFAun, BWBSdk, ESSFmcp, ESSFmvp, ESSFmc, ESSFmv3, ESSFmv4, SWBmk, and SWBmk.	5-Aug-16
TKN-186.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	If the information was available then a reference to Table 15.7-1 should have appeared in the Regional overview section. Regardless, no further action required.	Comment acknowledged.	4-Nov-16
TKN-187	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The Proponent should explain the discrepancy between stating that the baseline LSA was 16,626 ha, capability maps show a total area of 16,626, text in this sections states that TEM mapping was conducted in 2014 to fill in unmapped areas within the current LSA which is 16,658 ha and states that the TEM was used in both capability and suitability mapping. One could conclude that the habitat modeling area is equal to the current LSA which is 16,658 ha.	The current LSA is the same size as the TEM area and the habitat suitability modelling.	5-Aug-16
TKN-187.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	The LSA for capability mapping is not the same size as the LSA for the TEM and habitat suitability modeling. Regardless, no further action required.	Comment acknowledged.	4-Nov-16
TKN-188	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Please provide rationale as to why capability species accounts in the baseline report (Appendix 15-A) are different than species accounts in Appendix 15-B since the report states that habitat capability models were updated in 2014 using the same species accounts and ratings developed for the 2005 habitat suitability mapping (habitat capability modeling section). Within the habitat suitability modeling section there is no mention of the 2005 species accounts. It is assumed based on text provided that in 2014 new suitability species accounts were created and if this is a correct assumption an explanation should be provided especially since the baseline report contains no suitability mapping results.	Habitat suitability modelling was undertaken in 2015 and results are provided in Appendix 15-B. The knowledge of habitat use by the VCs mapped is finite and species accounts provide similar information that directs mapping regardless of the version the reviewer is referring to.	5-Aug-16
TKN-188.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	There are some slight differences between capability and suitability species accounts. For example in caribou the overall account focus' more on arboreal lichen feeding and suitability has more terrestrial lichen focus. The Capability species account states that age class 1-4 in forested ecosystems have minimal winter value for feeding because both terrestrial and arboreal lichen loads are low. But the suitability rating table shows that for SWBmk/02 (forested ecosystem) rates structural stage 1 and 3 for late winter with a 1 (very high). Regardless, no further action required.	Comment acknowledged.	4-Nov-16
TKN-189	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	There is a discrepancy between the baseline report and this summary of when surveys were done. Based on Appendix 15-A 2004 surveys were completed from February to July and not February and June; 2005 surveys were done February, March, April, May and June and not February and April. Please make necessary adjustments so that the same information is provided in both reports.	See memo **20160805 KUG Comment TKN 182 and 183_Caribou_Memo.**	5-Aug-16
TKN-190	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	A summary table showing how many caribou were observed during each aerial survey would be helpful. Especially since the paragraph states that four groups totalling 22 caribou were observed in April 2005 with one group of 13 and another group of 7 but there is no mention of the other two groups which if math is correct (13+7=20) were two sightings of individuals and not groups.	See memo **20160805 KUG Comment TKN 182 and 183_Caribou_Memo.**	5-Aug-16
TKN-190.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	The new table does show the number of caribou observed with each survey but the text does not state that 15 animals were observed in the LSA and 7 were observed in the RSA which could be considered an important distinction. Regardless, no further action required.	Comment acknowledged.	4-Nov-16
TKN-191	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	p.15-34 Please ensure that correct tables are referenced in this caribou habitat capability results section. The text refers to Table 15.4-8 which is a moose habitat table. If this is a correct table reference, please clarify the link between moose and caribou capability habitats	This was a text error; the reference to Table 15.4-8 is incorrect on p. 15-34 and should reference Table 15.4-3 instead, which agrees with the information presented within the sentence with the table reference, i.e., "Habitat capability mapping for Living in the spring identified approximately 1,184 ha (7% of the LSA) of High value and 630 ha (4% of the LSA) of Moderate-High value habitats within the LSA". Table 15.4-3 indicates that 1,183.7 (7%) of the LSA was High value spring habitat and 629.7 (4%) was Moderately-High value.	5-Aug-16
TKN-192	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	In the baseline wildlife report (Appendix 15-A, Section 11.2) it states that a caribou trail ran from the head of Kemess Creek through the mountains to Attycelley Creek. This information was based on Aboriginal traditional knowledge of the area, yet the Proponent does not indicate the potential Project effects on this trail or any other potential migration routes. Please provide an explanation as to why that movement corridor is not mentioned in this section and not identified as a possible movement corridor.	Movement was anticipated through the development, as such all infrastructure and activities were evaluated for their potential to disrupt movement, this included area that supported the trail mentioned.	5-Aug-16
TKN-193	26-Jun-16	C.Coady, EDI	Wildlife and habitat	For all wildife species, there appears to be no information pertaining to investigating/surveying for the presence of migration or movement corridors. Specifically, for mountain goat, caribou, moose, grizzly bear, efforts should have been made to determine movement corridors for these species. This information would help inform the effects assssment on disruption to movement.	Movement was anticipated through the development, as such all infrastructure and activities were evaluated for their potential to disrupt movement, this included area that supported the trail mentioned.	5-Aug-16
TKN-194	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The Proponent should provide a better explanation of why road vehicle traffic during construction was not considered especially when it says that the average number of vehicles and traffic levels will be higher during Construction which signifies a higher probability of vehicle and wildlife interactions.	The speed limit on Project roads will be 50 km/hr and wildlife will be given the right of way. The focus of the disruption of movement section was during Operations since that is when permanent structures such as the conveyor and the water discharge line will be in place. Although higher traffic levels will occur during Construction the associated mitigation will minimize wildlife interactions.	5-Aug-16
TKN-194.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	The table heading is **existing access road vehicle traffic** with only operations under project phase and does not refer to conveyor or water discharge line (unless author wants us to assume that these two features are the same as access road vehicle traffic). The response given does not provide a clarification because it could be assumed that the same mitigation measures should be in place during both construction and operation phases to minimize wildlife interactions.	Aurico acknowledges the confusion caused by the first round response. The Proponent was attempting to convey the following to address the first round comment: 1) The same mitigation to minimize or eliminate the effect of disruption of movement (and potential wildlife interactions) along all Project roads, both existing and new Project roads, will be the same for all phases of the Project, including 50 km/hr speed limits and wildlife right-of-way at all times when it is safe to do so (Chapter 24.19.4.2). Therefore, although higher traffic volumes than stated in Table 15.5-1 will occur during Construction, the associated mitigation will be effective at minimizing the potential effect and associated interactions. 2) The potential effect of disruption of movement is anticipated to be of the greatest concern during the Operations phase because this phase is the longest phase when permanent structures, such as the water discharge line and conveyor, will be in place, and the longest phase with consistent vehicle traffic volume of on average 12 trucks/day (Construction traffic volume, while potentially higher, will be experienced over a much shorter time frame). Hence, the focus of the assessment of disruption of movement was on the Operations phase as it is this phase that has the greatest potential to interrupt animal movements as a worst-case scenario. Considering the above, the higher traffic volumes that may be experienced during Construction are not anticipated to result in elevated interactions due to the proposed mitigation, and thus does not change the conclusion of the Application.	4-Nov-16
TKN-195	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Most of the noise mitigations are associated with vehicle or helicopter noise but no mitigation is put forward towards reducing effects from blasting. Maybe if applicable should consider not blasting during potentially "sensitive" periods for certain wildlife species (rut season, calving season) or blasting done in summer versus winter.	Blasting will only occur during the construction period and will be close to the surface for a limited amount of time to facilitate construction into the declines, predicted for a period of less than 6 months. Due to the short duration of blasting at the surface and minimal high quality habitat affected by blasting, no specific mitigation related to blasting is proposed.	5-Aug-16
TKN-196	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Please verify, and if necessary make corrections, that the sections referenced in the last paragraph of this section are correct. First sentence states that potential **quantitative** effects are described in Sections 15.6.1.1 but Section 15.6.1.1 is entitled Limitations and Assumptions Associated with **Qualitative** Assessments.	The section references were incorrect for habitat loss and alteration and sensory disturbance in the sentence "Potential effects due to 1) habitat loss and alteration, and 2) sensory disturbance were evaluated quantitatively and are described in the two following sections (Sections 15.6.1.1 and 15.6.1.2)." They should reference Sections 15.6.1.2 and 15.6.1.3.	5-Aug-16
TKN-197	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The Proponent states that habitat suitability and vegetation mapping were conducted as part of the baseline characterization studies for each wildlife VC. Methods and results of habitat suitability mapping are not presented in the baseline report (Appendix 15-A) but habitat capability is part of the baseline studies. Need to clarify why habitat suitability results where not included in the baseline report.	A separate baseline was prepared for habitat suitability mapping, Appendix 15-B.	5-Aug-16
TKN-198	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The Proponent states that habitat loss and alteration were assessed as a low magnitude non-significant effect in Chapter 13, Terrestrial Ecology. It should be clarified to what VC this low magnitude non-significant effect refers to.	This refers to the conclusions for alpine and parkland ecosystems as well as forested ecosystems.	5-Aug-16
TKN-199	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	For the proportional high quality and suitable habitat available in the RSA, the reviewer wonders if the calculation should be based on the amount of BEC subzones that are similar between the LSA and RSA. For example, if the RSA contains some ESSFmv4 then the amount of this area should be excluded from the proportion that would be available habitat within the RSA since this subzone was not included in the model. By including other subzones from the RSA this could potentially inflate the amount of available high quality habitat available in the RSA.	The comment is noted, Proponent thanks the reviewer for the suggestion.	5-Aug-16
TKN-200	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The Proponent states that three types of noise were evaluated for the Project during worst case noise conditions but don't explain why instantaneous noise due to traffic during Construction phase was not evaluated since it was previously stated that there would be more traffic during construction.	The expected noise from traffic is anticipated to be the same during Construction and Operations when the worst-case scenario for the vehicle with the largest noise emission is considered (i.e., haul truck). Noise was considered during Operations only because, although higher traffic volumes are expected during Construction, noise due to truck traffic will occur over a longer period of time during Operations. Considering the longer exposure time to truck traffic noise, the Operations phase was selected for evaluation.	5-Aug-16
TKN-201	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	It would be helpful if a definition of disturbed or functionally lost habitat was provided. What does "functionally" mean?	Page 15-158 indicates that "The blasting noise level threshold of 108 dB (Lpeak) represents "disturbed habitat" and was selected based on a range of threshold values (85 to 108 dB) identified for mammals resulting in flight response, freezing, or strong startle response (Manci et al. 1988; Weisenberger et al. 1996; Reimers and Colman 2006). The threshold of 120 dB was selected to represent "functional habitat loss," and was selected based on a range of threshold values (120 dB to 128 dB) identified as physiologically harmful to humans in the absence of specific guidelines for wildlife (Ontario Ministry of Environment 1977; Environment Canada 2010)."	5-Aug-16
TKN-202	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	This section states that three effects were scoped out of the assessment for caribou: direct mortality, indirect mortality, and attractants. But when looking at Table 15.5-3 there is a possible interaction with project activities with the potential effect of attractants and direct mortality. Indirect mortality is not listed in Table15.5-3 as a potential effect.	Table 15.5-3 is a tool used to identify potential effects for consideration as residual effects. Rationale as to why direct mortality, indirect mortality, and attractants were scoped out after being considered as potential effects is provided in Section 15.6.2.	5-Aug-16
TKN-203	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The first paragraph states that 'Habitat loss and alteration, sensory disturbance, disruption of movement, and chemical hazards are considered for the effects assessment….and result in a residual effect on caribou population.' 3 effects were scoped out: direct mortality, indirect mortality and attractants. But further in text it states that the potential effect of chemical hazards on caribou was also scoped out of the assessment.	Potential effects of chemical hazards on caribou were considered in sections 15.5.1.7, 15.5.2, and 15.6.2.4 of the Application, no residual effects were identified thus were scoped out of further assessment.	5-Aug-16
TKN-204	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The first paragraph states that 'Habitat loss and alteration, sensory disturbance, disruption of movement, and chemical hazards are considered for the effects assessment….and result in a residual effect on caribou population.' It is recommended that population be dropped since assessment really does not deal with the caribou population and typically text does not relate how project effects caribou population	Comment acknowledged.	5-Aug-16
TKN-205	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The paragraph just before the "Residual effect of habitat loss and alteration on woodland caribou" heading is a comment that may be more appropriately found under sensory disturbance since it states that an area will remain relatively isolated from sensory disturbance.	Comment acknowledged.	5-Aug-16
TKN-206	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Can the proponent please provide explanation for the use of the word 'negligible' amount in the first sentence. In Table 15.6-1 negligible is defined as "no detectable change from baseline conditions" and the previous paragraphs show that the effect of sensory disturbance is a loss of habitat. This would represent a detectable change from baseline conditions and remain as an effect even after mitigation. It could be considered a residual effect.	Functionally lost high-quality caribou habitat due to blasting a >120 db was only determined to affect 5.5 ha of summer caribou habitat which is 0.2% of the total high quality summer caribou habitat modelled within the LSA (Table 15.6-3). As such, it is considered a negligible change.	5-Aug-16
TKN-207	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Can the proponent please explain the discrepancy between the text stating that the magnitude of the effect is considered Medium and within Table 15.6-22 the magnitude is shown as being Low?	This effect should have been identified as Low in the text, consistent with Table 15.6-22. This rating was driven by the consideration of the short length (1.3 km) of the access road which will result in new disturbance through forested habitat.	5-Aug-16
TKN-208	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Please clarify how the amount of high quality habitat being removed or affected influences the conclusion of high confidence. Need to provide a better link between the amount of high quality habitat lost and disruption to movement patterns.	As stated on Pg. 15-179, High confidence is based on the state of knowledge regarding the general ecology of the northern mountain population of woodland caribou. There is a substantial amount of information about the species and habitat use, thus there is high confidence in understanding the effects.	5-Aug-16
TKN-209	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Please provide rationale why the potential residual effect was determined to be not-significant since significance can be based on professional judgement (Section 8.5.4). Please ensure there is a rationale for all VC residual effects.	The potential for the Project access road and pipeline to cause disruption of movement for caribou was deemed to be a residual effect with medium magnitude, discrete extent, long term duration, sporadic frequency, and moderate likelihood. On closure, the effect is deemed to be reversible. Potential effects to caribou were rated as moderate likelihood primarily because the habitat value along the access road is primarily low value and observations of caribou in the area of the access road have been few and the total effect would affect only 1.3 km of forested habitat. As a consequence, it was determine that this residual effect was not significant. The confidence in this determination is discussed on page 15-175 of the Application, and was rated as high confidence because the Thutade and neighbouring herds are thought to be stable and healthy, the amount of additional disturbance due to the project is low and the habitat quality along the access road is generally low.	5-Aug-16
TKN-210	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Section 15.6.2 states that the potential effect of chemical hazards on caribou was also scoped out of this assessment due to lack of exposure pathways to caribou (see Section 15.5.1.7) but Section 15.6.2.4 does assess the potential effect of chemical hazards on caribou. This discrepancy needs to be addressed.	Section 15.16.2.4 states "No residual effects as a result of the potential effect of chemical hazards are predicted for woodland caribou."	5-Aug-16
TKN-210.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	Typically if something is scoped out, a residual effects assessment is not performed, therefore this sentence still is unclear. Regardless, no further action required.	Comment acknowledged. Table 15.5-7 in Section 15.5.2.3, Summary of Screening Results for Potential for Exposure of Wildlife VCs to Chemical Hazards, lists the sources of COPCs and their potential interactions with wildlife VCs. For caribou, a potential interaction with COPC in water was identified. Considering this interaction, the potential effect was discussed in Section 15.6.2.4. The text in Section 15.6.2 regarding potential effects of chemical hazards being scoped out refers to the results of the evaluation of the potential for chemical hazards presented in 15.6.2.4, which concludes that there is a lack of exposure (ingenstion) pathway for caribou and molybdenum, because bioaccumulation of molybdenum is through the aquatic food web and caribou are primarily terrestrial herbivores and caribou are unlikley to consistently drink from just one source (Section 15.6.2.4). Aurico acknowledges that this text may cause confusion.	4-Nov-16
TKN-211	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The fourth paragraph refers the reader to Figure 15.4-5 to view the location of high quality early winter moose habitat. Figure 15.4-5 shows caribou summer habitat. Figure 15.4-6 should refer to high quality late winter moose habitat but this figure shows early winter moose habitat. The Proponent should go throughout the document and verify that all referenced figures in text point to the correct corresponding figure.	An error in the figure referencing for Figure 15.4-5 is acknowledged.	5-Aug-16
TKN-212	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	This section refers to baseline mapping results, because High and Moderately high quality habitat have been merged together for the assessment it is recommended that in the assessment section, the Proponent should not refer to the baseline mapping figures but those created as part of the assessment showing the merged habitat.	On page 15-181 in Section 15.6.3.1, there are references to the figures showing the merged habitats i.e. Figures 15.6-9 and 15.6-10.	5-Aug-16
TKN-213	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The Proponent states that moose may be attracted to the Project via road side vegetation which could provide foraging opportunities for moose but do not provide any qualitative assessment for this effect or how this will be mitigated. They only discuss roads as movement corridors in winter. Please provide some rationale why roadside vegetation is an attractant, the possible effect to moose (higher risk of mortality?) and what mitigation measures will be implemented so that there will be no residual effects.	Moose exploit low snow pack and abundant forage. Road right-of-way vegetation is at an early seral stage and will provide moose forage. This attraction has been considered in direct mortality effects. Plowing to provide moose escape from the road as well as employee education and traffic management including low speed limits and giving right-of-way to all wildlife (see Section 24.19) will mitigate effects for moose attracted to the road.	5-Aug-16

Kemess Underground Application Review - TKN Issues Tracking Table - January 6, 2017

	For Working Group Use				For Proponent Use	
ID #	**Comment Date**	**Reviewer Name / Agency (i.e. Alex Kwang, MEM)**	**Subject (See "instructions" tab)**	**Comment (Include Memo reference as applicable)**	**Proponent Response (Include Memo reference as applicable)**	**Response Date**
TKN-213.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	Proponent should consider mitigation/management measures as part of their wildlife management plan to reduce attractants of roadside vegetation to moose (removal of early seral stage vegetation that provides moose forage). Wildlife monitoring and management plans should be part of the terms and conditions of an EA certificate and should include TKN involvement in reviewing and implementing the plans.	Managing roadway vegetation to allow for increased visibility and re-vegetating roadsides with suitable species mixes to limit attracting wildlife (inlcuding moose) has already been identified as mitigation in the Wildlife Management and Monitoring Plan (Chapter 24) that will be developed in further detail to support permitting. Also, TKN will become members of the Environmental Management Committee that is expected to participate in development of EMPs (i.e. included as part of IBA).	10-Nov-16
TKN-213.2	23-Nov-16	R. Robitaille, EDI	Wildlife and habitat	The Proponent response is acknowledged and anticipated TKN participation in the permit review process and development and implementation of monitoring and management plans is also acknowledged.	The comment is noted.	21-Dec-16
TKN-214	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	On page 15-187, the Proponent should clarify that the numbers presented are for both seasons combined (early and late winter). It should be noted that the percent of the LSA disturbed is higher in early winter than late winter and both seasons combined (3% versus 2%).	The reviewer's comment is correct and acknowledged.	5-Aug-16
TKN-215	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	If blasting occurs during summer months, how will this affect moose? Habitat capability modelling would suggest that there is currently spring, summer and fall high quality moose habitat within the LSA. If majority of blasting occurs outside of early and late winter does this reduce the potential sensory disturbance on moose or any other wildlife VC species?	Winter is the most sensitive season for moose and other VCs that are most sensitive to noise, as such overall impacts will be reduced if blasting occurs outside of winter.	5-Aug-16
TKN-215.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	Efforts should be made to also avoid blasting during the calving season, as this is also another sensitive period for moose. This mitigation can be included as part of the Proponent's wildlife management plan.	The comment is acknowledged. Consideration of the timing of blasting on effects to moose during calving season will be included as part of the Wildlife Management Plan that will be further developed during the permitting phase with expected participation from TKN.	28-Oct-16
TKN-215.2	23-Nov-16	R. Robitaille, EDI	Wildlife and habitat	The Proponent response is acknowledged and anticipated TKN participation in the permit review process and development and implementation of monitoring and management plans is also acknowledged.	The comment is noted.	21-Dec-16
TKN-216	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Section 15.6.2.3 states the geographic extent is considered **Discrete** for Caribou because the effect is limited to the areas immediately surrounding the Project. It should be noted that baseline data (telemetry location) show that caribou have been observed in areas of existing access (also airstrip) which could be described as the Kemess Creek Drainage area. But for moose the geographic extent is **local** because disruption is related to the use of existing roads, within the Kemess Creek Drainage, the conveyor, and the proposed KUG TSF Discharge Waterline. Please clarify why the geographic extent is different for both of these ungulates since they appear to move within the same areas.	This discrepancy is an oversight and spatial extent should be Local for both caribou and moose.	5-Aug-16
TKN-217	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Figure 15.6-10 shows that the majority of high quality late winter habitat is located adjacent to Thutade lake and Attichika Creek and a large proportion of this area is mapped as being wetlands (Appendix 13-A Figure 2.4-2) and text here states that during summer moose prefer wetlands and during winter they prefer closed forests. The Proponent should ensure that all habitat descriptions are addressed similarly and that no discrepancies occur.	Comment acknowledged.	5-Aug-16
TKN-218	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The first paragraph on page 15-193 states that the risk of moose-vehicle collisions is evaluated in Section 15.6.3.2. Section 15.6.3.2 is actually Sensory Disturbance on Moose and Section 15.6.3.4 is Mortality on Moose. Please make necessary corrections that text refers to correct section. Please ensure that all wildlife sections are reviewed to ensure accurate sections are referenced in text.	An error in the section referencing is acknowledged.	5-Aug-16
TKN-219	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The assessment states that 'Ramps will be placed at regular intervals in order to allow movement of moose across the pipe' but Section 15.6.2.3 states that 'the proponent proposes to create crossing structures along the Proposed Discharge Line such as crushed gravel poured over the pipe at regular intervals to facilitate wildlife crossing". Please clarify which mitigation measure will be used. It is assumed that the same mitigation measure can be used for all ungulates.	These mitigation measures are the same thing, expressed differently. The ramps are likely to be made of crushed gravel.	5-Aug-16
TKN-219.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	Consistency in mitigation measure descriptions would have prevented the requirement. No further action required.	The comment is acknowledged.	28-Oct-16
TKN-220	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Appendix 15-B section 2.3.3.3 states that summer habitat was modeled similarly to winter where topographic features (distance to escape terrain and elevation) and vegetation features were used to develop the model and there is no mention of kidding habitat characteristics. This section states that assessment includes an evaluation of summer habitat loss and alteration because mountain goats are also susceptible to disturbance during the kidding season in spring and summer however kidding habitat is not addressed specifically in the habitat modelling.	High quality goat summer habitat can assumed to be high quality kidding habitat as attributes are effectively the same at the scale of resolution provided by the ecosystem maps.	5-Aug-16
TKN-220.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	This response should have been stated in this section. No further action required.	Comment acknowledged.	4-Nov-16
TKN-221	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Can the Proponent please provide a reference as to who identified kidding habitat in the area to the east of the East Cirque Creek?	The kidding habitat was identified by Ardea Biological Consulting Ltd.	5-Aug-16
TKN-221.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	This response should have been stated in this section. No further action required.	Comment acknowledged.	4-Nov-16
TKN-222	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	This section states that mountain goats will move to access mineral licks. The Proponent should identify if any mountain goat mineral licks are found within the LSA or state that there are no mineral licks within the LSA.	No mineral licks have been identified along any of the proposed access routes or within the proposed subsidence area in any of the surveys carried out since 2003. In addition, no mineral licks have been observed within the LSAs associated with the Kemess Underground, formerly proposed Kemess North, or Kemess South projects.	5-Aug-16
TKN-222.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	This information should have been included in the assessment. No further action required.	Comment acknowledged.	4-Nov-16
TKN-223	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	This section should also address any concerns associated with predators and if they have greater potential to access mountain goat habitat due to project activities. Please provide information pertaining to this potential Project effect.	Goat use escape terrain and this is a key feature for habitat. No linear features will provide increased access for predators to areas near escape terrain and increased predation on mountain goat is not expected to occur. Increased mortality due to predator access, as well as hunter and recreational user access, along linear corridors was also considered in the ORAR Assessment (Appendix 15-C). The assessment concluded that indirect mortality for mountain goat along the ORAR would be a residual effect because there was some, albeit minimal, overlap between the ORAR and ungulate winter range (UWR) for mountain goat, and thus a potential for increased access into goat habitat (see Section 5.4 of Appendix 15-C). The magnitude of this potential effect was considered negligible because of the remoteness of the area, the infrequent overlap of the northern portion of the ORAR with mountain goat UWR, mitigation measures designed to restrict additional access by snowmobilers, the location of mountain goat habitat in high elevation rugged terrain, and infrequent rates of predation on mountain goats by wolves in winter (in a moose dominated system, mountain goats are not frequently preyed on by wolves in winter due to deep snow at high elevation and the association of mountain goats with steep rugged escape terrain). Overall, the indirect mortality due to the ORAR was considered Not Significant for mountain goat (Section 5.4 of Appendix 15-C)	5-Aug-16
TKN-224	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	It is true that fisher and marten do have similar habitat requirements but fisher maternal denning (typically associated with large cottonwood or aspen trees) habitat requirements are more specific than marten. Typically fisher winter habitat is found at lower elevations than marten since they are more restricted by snowpack depth. In general, marten have the potential to be found in areas of deeper snow than fisher.	The high elevation Spruce Willow Birch (SWB) and Boreal Altai Fescue Alpine (BAFA) biogeoclimatic zones (BEC) associated within the LSA are not sufficiently productive to provide tree stems of suitable size to support fisher denning. Snow pack within the RSA will not preclude fisher from using any habitat exploited by marten.	5-Aug-16
TKN-225	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Wolverine are also known to prey on caribou. Effects on habitat of caribou can also be included to assess wolverine habitat.	Comment noted.	5-Aug-16
TKN-226	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The Proponent should provide information on home range location and size if this information is incorporated into the effects assessment. Provide a link between the amount of habitat loss compared to possible home range size. By doing this, it shows if the loss of 318 ha of high quality habitat does or doesn't create an effect. Regardless, the loss of any amount of habitat should be considered a residual effect since direct habitat loss cannot be eliminated with mitigation.	The home range of marten average between 0.4 and 2.4 marten/km² (Hatler et al 2003) suggesting loss of production of between 1 and 8 marten per year may occur. However, the Project footprint area includes 487 ha, where < 100 ha is due to the infrastructure itself and the remaining area is due to buffers around infrastructure. The additional area considered in the assessment to account for final siting changes as well as habitat alteration due to construction activities around the infrastructure. Therefore, all habitat loss and alteration estimates presented are highly conservative as it is anticipated that as little as 15% of the total footprint area will actually be affected. Hatler, D.F., D.A. Blood, and A. M.M. Beal. 2003. Furbearer management guidelines for marten. Prepared for the B.C. Ministry of Environment, Victoria, BC.	5-Aug-16
TKN-226.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	This additional information would have been good to include in this section of the assessment. Regardless, no further action required.	Comment acknowledged.	4-Nov-16
TKN-227	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Even though habitat loss and alteration for moose and mountain goat was not considered a residual effect would the cumulative effect of loss within both these habitats within the LSA be considered a greater loss for wolverine habitat considering that wolverine habtiat was identified based on prey-species habitat? So there is the potential of a loss greater than just 84 ha of wolverine habitat.	Yes, that is correct	5-Aug-16
TKN-228	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Section 15.6.6 states that wolverine dens can be considered unique habitat features (use high elevation areas where deep snow accumulates) there is no mention of any potential denning habitat loss or alteration. Please provide some information around the possible loss of wolverine denning habitat especially since the focus of the assessment is the loss of feeding habitat.	Denning habitat cannot be effectively modelled with the available ecosystem map products. Unique environmental conditions require survey. Pre-construction surveys identified in Chapter 24.19 will be used to detect dens if construction is to occur during the key denning period.	5-Aug-16
TKN-229	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The Proponent should state if the conveyor will impede wolverine and marten movement during winter. It could be assumed that marten will not be able to pass underneath the conveyor when snow is deeper than bottom of conveyor (i.e. approximately greater than 15 cm) and less than top of conveyor.	It is anticipated that the ground below the conveyor will be snow free and marten and fisher may access below the conveyor similar to subnivean behavior used for accessing prey . How operation of the conveyor may influence behavior is unknown.	5-Aug-16
TKN-230	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The Proponent should include information on direct mortality due to collisions with vehicles for wolverine. Data/information from the ORAR during the KS Mine operations would be valuable information to include in this section. At a minimum, information from other similar roads or roads in the same region should be included in this section.	During Kemess South operations only wildlife incidents and observations on site were recorded and not any along the ORAR. There was one wildlife incident of a collision with a vehicle and a moose but none with wolverine.	5-Aug-16
TKN-231	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Please provide a reference that shows that grizzly bear and wolverine have similar attractant behaviour. Literature shows that wolverine have a tendency of avoiding areas with anthropogenic activity. One could assume that they would be less attracted to human waste and other areas associated with the camp than grizzly bears.	In ERM's experience in the arctic and projects in northwest BC, wolverine can also be attracted to camps and associated infrastructure.	5-Aug-16
TKN-232	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Please provide information on chemical hazards associated with wolverine. The text here only discusses potential effect to marten.	Chemical hazards for marten would be similar for wolverine as they are closely related (being mustelids).	5-Aug-16
TKN-232.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	This information should have been stated in assessment. No further action required.	Comment acknowledged.	4-Nov-16
TKN-233	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Within the residual assessment section (Section 15.5.1.3) it states that disruption of wildlife movement was identified as a potential effect where the Project footprint and associated infrastructure interrupts movement. The text describes a link to habitat fragmentation with a discussion of wildlife movement corridors and how roads may act as barriers. However, in the Cumulative Effects section, a paragraph states that the residual effect of disruption of movement is a potential cumulative effect and further states that this disruption is caused by habitat loss and alteration with no mention of habitat fragmentation and effects to movement corridors. It is recommended that for all wildlife species with disruption of movement as a residual effect that a stronger link between habitat loss and alteration, habitat fragmentation and wildlife movement (corridors) be established throughout the Cumulative Effects section.	The link provided is based on current, available knowledge of the VC and provides an assessment based on the current body of knowledge. In absence of more robust understanding of this, a stronger link cannot be presented. In these cases, the assessment erred on the side of caution to account of the information shortfall.	5-Aug-16
TKN-233.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	This information should have been stated in assessment. No further action required.	Comment acknowledged.	4-Nov-16
TKN-234	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The rationale of potential for cumulative effects for most wildlife species does not mention any disruption to migratory routes or effects caused by linear features (conveyor, transmission lines, roads) which are mentioned within the potential project effect assessment. Please incorporate effects to movement corridors into this section if there are known wildlife corridors within the RSA.	Assumptions have been made regarding the presence of movement corridors based on available habitat and geography. These features are site specific within the LSA and in absence of overlapping development in the LSA, no cumulative effects are anticipated.	5-Aug-16
TKN-235	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Please provide rationale for why BEC units were considered to have or not have suitable habitat for each VC listed in the table	Rationale and assumptions used to complete habitat suitability modelling are presented in Appendix 15-B.	5-Aug-16
TKN-235.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	But Appendix 15-B only identifies the WHRs for ecosystem units identified within the LSA and the LSA does not have any BWBSdk or ESSF ecosystems. So how were these units ranked?	BEC units were used as coarse way of potentially scoping out projects or activities from the cumulative effects assessment if the VC was not expected to occur within them. No further ranking of suitability was performed. The only VCs for which BEC units were scoped out were hoary marmot, olive-sided flycather, and western toad. No suitable habitat is anticipated in lower elevation BEC units for hoary marmot (SWBmks, BWBSdk, SWBmk) and conversely no suitable breeding habitat was anticipated within BAFAun for olive-sided flycatcher or western toad as indicated in Table 15.7-1.	4-Nov-16
TKN-236	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Please provide a definition of what was considered suitable habitat for the VC.	For the cumulative effects assessment, suitable habitat was broadly classified as the BEC units from the RSA that each VC is associated with, in order to determine if other projects and activities could interact with the VCs with potential cumulative effects (p. 15-325). It was assumed that some part of these BEC units would contain suitable seasonal habitat that would be used by VCs; assumptions of use were based on species ecology and seasonal habitat requirements as detailed in Project Setting (Section 15.4). The BEC units that were determined to contain suitable habitat for VCs are outlined in Table 15.7-1. Generally speaking, for caribou, moose, grizzly bear, and furbearers, it was assumed all BEC units present in the RSA would contain suitable habitat, as these species use a wide variety of forested and non-forested habitats both below and above the treeline throughout the year (save for american marten which was not anticipated to use the highest elevation habitats present (BAFAun BEC); Sections 15.4.3.1, 15.4.3.2, 15.4.3.4, and 15.4.3.5). For hoary marmot, it was assumed that all but the lowest elevation habitats in the RSA could contain suitable habitat that would be used (i.e., habitat in the SWBmks, SWBmk, and BWBSdk were all assumed to be too low to contain habitats preferred and used by hoary marmot, which include areas of lush sub-alpine to alpine vegetation in proximity to rocky areas for denning; Section 15.4.3.6). For olive-sided flycatcher and western toad, all but the highest elevation BEC unit (BAFAun) was assumed to contain suitable habitat. Olive-sided flycatcher occupy a wide range of forested habitats from valley bottom to the subalpine but are not assumed to use alpine habitats due to the lack of suitable trees for nesting and foraging (Section 15.4.4.3). For western toad, alpine habitat was not assumed to contain suitable breeding habitat (e.g., wetlands) that would be used by western toad (Section 15.5.5).	5-Aug-16
TKN-237	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	On page 15-325 it is stated that 'Explanations for projects and activities being excluded are given in the VC sections below'. But the sections below only state certain activities are not anticipated to contribute to an effect but no explanation or rationale which led to this conclusion is provided. Please provide the rationale for the exclusion conclusion for all VCs.	The activities of guide outfitting, trapping, public recreation, water use and grazing are the activities excluded the reviewer is referring to (e.g. pg. 15-326). There is no evidence to suggest that these activities will alter in intensity in future or interact with other development effects and current intensity is considered baseline. As such they were excluded from cumulative effects assessment for wildlife.	5-Aug-16

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TKN-238	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The assessment states that 'Given the localized spatial extent of the effect, the potential to interact with the zone of influence of other industrial projects in the region is unlikely'. This sentence needs to be clarified. What is the zone of influence for these other projects?	The zone of influence includes the area where effects from other industrial developments can potentially impact wildlife VCs. The assessment suggests that no other industrial projects are close enough to result in overlapping effects.	5-Aug-16
TKN-238.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	This information should have been included in the assessment.No further action required.	Comment acknowledged.	4-Nov-16
TKN-239	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	There should be a stronger link showing the relationship between habitat loss or alteration and road density with disruption of movement. There should be mention of how other project infrastructures and access (snowbanks along roads, snowmobile trails or ATV trails) can influence movement especially along movement corridors. This comment is also directed at all VCs with disruption of movement as a residual effect.	The link between habitat loss and alteration and disruption of movement is discussed in the section on Disruption of Movement (p. 15-105). The loss of habitat within the Project footprint and along the access road was evaluated as both habitat loss and for the potential to disrupt wildlife movement. When road and trail density is low, this is a reliable approach to evaluating potential effects on wildlife. As the road density increases, habitat can become sufficiently fragmented that it is effectively lost as wildlife habitat, despite the actual area lost being relatively small. This potential effect was evaluated in the cumulative effects assessment by calculating the road density within the RSA and comparing this value to thresholds published in academic literature. For instance, the road density 0.08 km/km² in the RSA is a magnitude of order less than the threshold of 0.6 km/km² identified for grizzly bear in the literature. Due to the low number and length of new roads planned, the Project is not expected to substantially increase to the pre-existing habitat fragmentation. As a consequence, the Application evaluated both habitat loss and fragmentation for both the Project and as a cumulative effect and any synergies that may occur between the two. No additional analysis or description is required.	5-Aug-16
TKN-240	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Please provide reference or information that provides rationale to use a grizzly bear road density threshold for moose movement and provide rationale for how this is linked to the disruption of movement effect. Please provide this rationale for all species where road density is used as a measurement for disruption of movement.	Road densities of 0.6 km/km² and 1.2 km/km² are used for ungulate thresholds (e.g. Beazley et al (2004) and Environment Canada (2014)). 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.	5-Aug-16
TKN-240.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	This reference and rationale should have been provided in the Application. No further action required.	Comment acknowledged.	4-Nov-16
TKN-241	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Please provide a rationale or threshold reference that demonstrates that a habitat alteration of 4% can be considered a minimal loss and that a minimal loss does not lead to a cumulative effect. Please provide this rationale for all VCs where habitat loss is not carried forward into the cumulative effects assessment.	Habitat alteration within the RSA that leads to the 4% change in the RSA cited in this section is primarily due to forestry as summarized in Table 15.8-3. Due to knowledge of foraging and habitat use by moose, this alteration to the landscape is a change but it is not necessarily a negative change for moose as they can take advantage of early seral stage vegetation in areas where forestry has occurred.	5-Aug-16
TKN-241.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	Please provide a rationale for all VCs (not just moose) where habitat loss is not carried forward in the effects assessment.	In response to action items assigned during the September 15, 2016 Working Group Meeting, TKN-086 and TKN-24.1, AuRico has prepared a memo regarding what is considered a residual effect or not (**20161103_KUG Comments TKN_WG Meeting Sept 15 2016_Memo)**. In the memo AuRico clarifies that the potential effects of habitat loss and alteration, as well as sensory disturbance, were carried forward as residual effects and characterized according to the EAC Application methodology, if the effect resulted in a greater than 5% change in the suitable habitat available in the LSA. For further details, please refer to Memo **20161103_KUG Comments TKN_WG Meeting Sept 15 2016_Memo**	4-Nov-16
TKN-242	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Wolverine and marten behaviour and habitat are different. The disruption of movement on furbearers should be discussed separately for each species like in the residual effect assessment. The effect of attractants was a residual effect for wolverine and is not discussed within this cumulative effects assessment but listed in Table 15.9-1. Please rectify these information omissions.	Wolverine are far ranging predators that can exploit a variety of habitats provided it supports prey. This includes moose, caribou, goat and marmot. As these habitats have been modelled and impacts to these prey have been assessed, the results can be extended to wolverine. Effects of attractants occur at relatively small scale, local to a specific development. There are no other developments in the area that would lead to cumulative effects related to attractants.	5-Aug-16
TKN-242.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	Response acknowledged, however, the section on disruption of movement only discusses wolverine and mentions fisher. There is no discussion on marten who are not as far ranging predator. Regardless, no further action required.	Comment acknowledged.	4-Nov-16
TKN-243	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	p. 2-3 In section 12.6.1.1 of Appendix 15-A the author states that WHA plots were used to collect standardized information for evaluating habitat suitability and evidence of use. Wondering why some of the field data collected was not used as a way of verifying habitat models? Can the proponent also clarify why there is no mention or reference to the WHA field work completed and mentioned in Appendix 15-A?	As a consequence, the EA Application evaluated both habitat loss and fragmentation for both the Project and as a cumulative effect and any synergies that may occur between the two. No additional analysis or description is required.	5-Aug-16
TKN-243.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	The response does not answer the question. The comment deals with a statement in Appendix 15-B and not in the Cumulative effects section of Chapter 15.	Baseline surveys and WHA plot data were collected by Ardea while habitat suitability modelling was conducted by ERM. ERM used baseline observations of animals collected by Ardea to visually determine if modelling results looked appropriate as presented in Figures in Appendix 15-B. No wildlife habitat assessment plot data was available at the time of the habitat suitability modeling was completed. Additional effort is being expended to determine if wildlife assessment plot data is available and can be used to verify suitability mapping results. AuRico and ERM understand this information may result in greater confidence in the habitat suitability modelling results and effects assessment conclusions; but emphasize that additional information regarding model verification would not influence the conclusions of no significant effects to wildlife. Any additional information that can be obtained to verify habitat suitability model results will be shared and reviewed with the TKN and would be considered in development of a wildlife management plan to support the Mines Act permitting process. At the request of the MFLNRO, a verification of the habitat suitability modelling for the Project was conducted by comparing animal and sign observation to the model results ; see **20161020_KUG Comments_FLNRO 024.1_habitat suitability_Memo** for further explanation (FLNRO Memo). The results of the verification indicated that most models predicted animal use well (with larger numbers of animals observed in higher rated habitats), although caution was warranted as baseline data was not collected in a manner that was designed for field-truthing models (see **20161020_KUG Comments_FLNRO 024.1_habitat suitability_Memo** for details).	10-Nov-16
TKN-244	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Can the Proponent please provide an explanation why the paragraph states that suitable calving habitat is found in flat areas while table 2.3-1 rates areas with slope 15-33 degrees as being the best (rank 1) (species account just states under rating assumptions that slopes <45% are favoured for breeding and calving).	Flat areas refer to microtopography within sloped habitat.	5-Aug-16
TKN-245	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Spelling error (*Clandina* spp.) it is assumed it should be (***Cladina*** spp.)	That is correct.	5-Aug-16
TKN-246	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Spelling error "High and Moderate high rated later winter habitat" should be **late** winter habitat.	That is correct.	5-Aug-16
TKN-247	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The Proponent writes that 12% of the LSA is rated high and moderately high but when you add 1.7 + 9.7 = 11.4 which should be 11% and not 12%. There is no consistency between how percent values taken from tables are inserted into text (if a number was rounded up or down) within the results section for all species. Please make it consistent for all tables in the Application.	Minor error in rounding is noted.	5-Aug-16
TKN-248	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Please clarify why public recreation is only considered to occur within the three provincial parks and protected areas? It could be argued that hunting and fishing are recreational activities that could occur anywhere on crown land and lakes. ATVing and snowmobiling are also recreational activities that could potentially occur within the RSA.	AuRico acknowledges that public recreation occurs outside of the provincial parks. The non-traditional land use baseline report (Appendix 17-A of the Application) considers public recreation, including hiking, camping, wildlife viewing, fishing, and hunting, snowmobiling and use of all-terrain vehicle in the Local and Regional Study Areas. The report indicates that public recreation is limited due to the area's remoteness and lack of infrastructure. For example, there are few park visits. Hunting activities are also discussed in relation to guide outfitting (Section 8.7.1.3, Table 8.7-3 and Figure 8.7-5). Potential indirect effects of snowmobile use along the Omineca Resource Access Road is considered in Appendix 15-C.	5-Aug-16
TKN-249	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Please provide a clearer definition or description of what is considered a residual cumulative effect or a definition or description of why an effect is not considered residual cumulative effect especially where quantitative data is used.	Cumulative residual effects are effects that arise as a result of a residual effect from the Project interacting with residual effect(s) from another activity to create a cumulative effect (also used: cumulative change, cumulative impact). For wildlife the residual effects carried forward into the cumulative effects assessment were disruption of movement (woodland caribou, moose, grizzly bear, furbearers) and habitat loss and alteration (hoary marmot and olive-sided flycatcher). Habitat loss and alteration within the appropriate RSAs (general or caribou) were used as a proxy for disruption to movement but were not found to lead to a cumulative residual effect for disruption to movement. Habitat loss and alteration for hoary marmot were very low percentages of the general wildlife RSA (0.03% and 0.08% respectively). While habitat loss and alteration for olive-sided flycatcher was more (0.3% and 4% respectively), habitat alteration primarily due to forestry activities is not necessarily negative especially after 10+ years of regrowth when some suitable conditions may have occurred for olive-sided flycatcher nesting. As such, despite quantitative analyses, no cumulative residual effects were identified from interactions between Project residual effects and effects due to other projects and activities in the wildlife RSAs.	5-Aug-16
TKN-250	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Under Seasons of Use and Ratings Assumption why are the BWBS and SBS BEC subzones mentioned and not the SWB? The LSA does not contain any BWBS or SBS.	These BEC subzones occurred in the RSA.	5-Aug-16
TKN-250.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	The reviewer acknowledges that BWBS and SBS occur in the RSA but the RSA which includes the LSA contains SWB. The point was that SWB should have been included in table. Regardless, no further action required.	Comment acknowledged. All BEC zones present in the LSA and RSA should have listed in goat species account, this was an oversight.	4-Nov-16
TKN-251	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Please fix or clarify why the text states that the RSA was the same for all wildlife except caribou and grizzly bear which had different RSAs but the legend in figure 15.3-2 states that wolverine and grizzly bear have same RSA. Please either remove wolverine from the legend or add wolverine to all the corresponding the text.	The inclusion of wolverine in the legend on Figure 15.3-2 is an error and the text is correct; the RSA is the same for all wildlife save for caribou and grizzly bear.	5-Aug-16
TKN-252	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Can the Proponent please provide rationale as to why maps show habitat in a raster format when TEM polygon boundaries which were used to assign ratings is in vector format? If a layer was converted to raster format a comment should be included in the habitat modelling methodology. This clarification applies to all wildlife VC habitat maps.	Several habitat suitability maps were indeed presented in a raster format and not the underlying TEM vector data due to the modelling process. For several species, additional topographic data were used to identify suitable habitat. Topographic data included Digital Elevation Model (DEM) information and 1:20,000 Terrain Resource Information Management (TRIM) data - these data are provided as raster data. The species and seasons which DEM and TRIM data were used included caribou late winter, moose late winter, mountain goat summer and winter, and hoary marmot growing. The data were translated into the underlying raster format when outputting the final habitat models for visual presentation.	5-Aug-16
TKN-253	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Can the proponent please provide rationale as to why the LSA contains more suitable high late winter caribou habitat (1,104) than capable high late winter caribou habitat (598 ha)? Based on the capability definition it can be assumed that an area should contain more high quality habitat under this model since it would include current high quality habitat and any possible high quality habitat that could occur in future. While suitability mapping would only show the current high quality habitat. This clarification applies to all wildlife VCs where capability and suitability modelling was completed.	Suitability mapping was updated with a more recent ecosystem map product and based on attributes more reflective of Environment Canada (2014). The suitability mapping was used for the assessment, capability mapping was not. Environment Canada. 2014. Recovery Strategy for the Woodland Caribou, Southern Mountain population (Rangifer tarandus caribou) in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa, ON	5-Aug-16
TKN-253.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	This addresses the comment with regards to Caribou but does not address comment with regards to other VCs. For example moose in section 15.4 states that the capability mapping found no habitat that could be ranked as high winter living and only 317.7 ha was mapped as moderately high. Meanwhile the suitability mapping states that there is 1362.6 ha of high early winter habitat and 281.6 ha of high late winter habitat. Another example is that the Mountain Goat section states that based on capability mapping there is 7.7 ha of high winter habitat but suitability mapping show that there is 825.8 ha of high winter habitat.	The moose capability mapping did not consider early winter separate from late winter and excluded SWBmks and BAFAun subzones (modelling assumption #9 on page A7-44 of Appendix 15-A) while it was modelled separately from late winter for suitability modelling. These areas were included as early winter habitat for the suitability modelling. Ratings tended to be higher in high elevation areas for mountain goat in winter for the suitablty modelling (Figure 3.3-1 in Appendix 15-B) as compared to capability modelling (Figure 12.8-1 in Appendix 15-B). The capability modelling rated the area close to mountain goat observations the highest. Suitability modelling results with greater amounts of high quality habitat estimated as compared to capability modelling results resulted in a more conservative approach with regards to the conclusions of the Application.	10-Nov-16
TKN-254	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The Proponent should provide some clarification around the potential effects listed with each Project component and activities list and wildlife lists. For example, the text states that sensory disturbance is not a potential effect for amphibians but the activities associated with construction of the mine site access corridor and collar tunnel entrances will have potential effect of habitat loss and alteration, sensory disturbance, and disruption of movement which are expected interactions with amphibians.	Potential effects listed in Table 15.5-3 are those associated with one or more of the wildlife VCs indicated to have an interaction, it is acknowledged that not every VC will have the same interaction with any specific component or activity. Potential effects are described generally in Section 15.5.1 and VC by VC Section 15.6. Specific to western toad and sensory disturbance, the rationalization for excluding the assessment of sensory disturbance to western toad is provided in Section 15.6.2. Sensory disturbance is not considered a potential effect on western toads because the population within Northwest BC is considered a subpopulation of western toads known as the non-calling population, which are therefore not dependent on auditory cues for finding mates. Therefore, the effect of sensory disturbance on western toads was not assessed (p. 15-309).	5-Aug-16
TKN-255	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Please clarify why the potential effect of indirect mortality does not appear in the project effects on wildlife table but is discussed as a potential effect?	It was an oversight not to include it in Table 15.5-3. It could have been associated with "Construct mine site access corridor and collar tunnel entrances" as indirect mortality is primarily considered in relation to new linear corridors leading to increased hunting pressure either due to humans or carnivores.	5-Aug-16
TKN-256	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The first paragraph does not mention the attractant effect. This paragraph separates the possible effects into either qualitative or quantitative method assessments. Also it is believed that the reference in parentheses should state if numbers refer to a section or a table. For example (Table 15.6.2-13) and not (15.6.2-13). This could be an error since the number does not correspond to a section or table.	The first paragraph should mention attractants as being measured qualitatively along with the other effects addressed this way (disruption of movement and direct and indirect mortality). It should be noted that attractants and the way it was addressed (quantitative vs. qualitative) is described in detail in Section 15.6.1.1. It is noted that there is confusion with numbers provided in parentheses in the first paragraph under Section 15.6.1. The reference in parentheses is referring to section numbering for which assessments to VCs are provided, and should read as (Section 15.6.2 to 15.6.13).	5-Aug-16
TKN-257	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The Proponent should clarify that the listed % LSA heading signifies that this is not a calculation based on the Area of the LSA but a calculation based on the total available high quality habitat in the LSA. For example early winter winter % LSA is calculated by using the total high quality habitat available in the LSA (232 ha) and not total LSA area (16,658 ha). This clarification should be applied to all wildlife VCs where this calculation has been completed in summary tables.	It is acknowledged that this clarification on % LSA (as meaning % of available high quality habitat within LSA) was not added to the assessment. However, it should be noted that tables for Habitat Loss and Alteration for each VC contain three headers, High Quality Habitat Lost, High Quality Habitat Potentially Altered Due to Subsidence, Total High Quality Habitat Lost and Altered, under which an area of the habitat affected is provided and a percentage of the LSA. Use of these headers was meant to indicate that the percentage of the LSA provided was in relation to high quality habitat, not the entire LSA. Text references to tables for Habitat Loss and Alteration for each VC do specify that information provided in these tables do refer to available high quality habitat in the LSA, for example, p. 15-181, "Of the 1,892 ha of high-quality late winter habitat identified in the LSA, 59 ha (3.1% of the LSA) will be lost or altered due to the Project footprint including buffers (Table 15.6-4, Figure 15.6-10)".	5-Aug-16

Kemess Underground Application Review - TKN Issues Tracking Table - January 6, 2017

	For Working Group Use				For Proponent Use	
ID #	**Comment Date**	**Reviewer Name / Agency (i.e. Alex Kwang, MEM)**	**Subject (See "instructions" tab)**	**Comment (Include Memo reference as applicable)**	**Proponent Response (Include Memo reference as applicable)**	**Response Date**
TKN-258	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	For American marten there appears to be two magnitude descriptors (Low and Medium) please select the appropriate one.	The appropriate descriptor is Low.	5-Aug-16
TKN-259	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	This table is not referred to within associated text. Please insert reference to this table within the associated text.	The table is referenced on page 15-187.	5-Aug-16
TKN-260	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Please provide rationale why the area of high-quality habitat disturbed due to Instantaneous Traffic Noise does not appear on maps (Figures). This clarification applies to all wildlife noise and high quality habitat figures and tables.	Predictive noise modelling (Appendix 7-D) did not include area predictions of elevated noise related to traffic. Table 5.6 of Appendix 7-D provides estimated of peak sound levels associated with traffic. This information was used to calculate the area of high-quality habitat disturbed due to instantaneous traffic noise exceeding 75 dBA from the noise source with sound power levels of 110 dBA. This is projected to extend 40 m from all site roads features.	5-Aug-16
TKN-261	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Can the Proponent please provide the rationale for the slope scores. The species accounts (Appendix 15-A and Appendix 15-B) do not explain how slopes are a characteristic of habitat except in reference to calving habitat and this table deals with late winter habitat.	Slope scores were based on observations of caribou from inventory associated with a project in the nearby Kutcho drainage (Rescan 2008). Rescan. 2008. Kutcho Project Wildlife Habitat Suitability Baseline Report. Prepared for Kutcho Copper Corporation by Rescan Environmental Services Ltd. November 2008.	5-Aug-16
TKN-261.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	This information should have been referenced in the Application. No further action required.	Comment acknowledged.	4-Nov-16
TKN-262	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Please explain how the combined season data was calculated including the reason that seasons were not just added together.	The area of combined early and late winter seasonal habitat was calculated by overlaying the two habitat models on one another and identifying the cumulative high quality habitat across the whole winter period. Some areas of habitat were high quality habitat in both the early and late winter habitat, particularly along Attichika Creek (see Figures 15.6-9 and 15.6-10). Therefore, the combined numbers consider this overlap in high quality habitats between the early and late winter, whereas adding early and late winter together would result in an overestimation of the available high quality winter habitat.	5-Aug-16
TKN-262.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	Agree that simply adding would have resulted in over estimate.	Comment acknowledged.	4-Nov-16
TKN-263	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Can the Proponent please clarify if any workers are using the ORAR to get to site during construction and operations and if yes, what would be the average daily number of vehicles?	Project related traffic is expected to be 12 vehicles per day, see Section 15.5.1.3 of the Application.	5-Aug-16
TKN-263.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	Section 15.5.1.3 states that potential disruption to movement associated with the use of the ORAR is assessed in Appendix 15-C which we can conclude excluded from Chapter 15 assessment. It was previously stated in a response that majority of workers will fly into site and will only use the main access road. Regardless, no further action required.	Comment acknowledged. Reviewer is correct; potential effects to wildlife due to use of the ORAR are evaluated in Appendix 15-C and are not considered in Chapter 15. As noted, workers are not expected to use the ORAR for travel to and from site; use of the ORAR will be for movement of supplies, equipment and concentrate (see p. 1-2 to 1-3 of Appendix 15-C).	4-Nov-16
TKN-264	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Can the Proponent please clarify why Fisher also a provincially blue-listed furbearer is not mentioned or a rationale for exclusion?	Fisher was not raised as a potential VC or indicator during development of the VC Scoping Summary (ERM 2014) or the AIR (EAO 2016), thus was not included in the EA. It is noted that fisher natal and maternal denning habitat are considered the most sensitive habitats for fisher. These habitats are associated with large diameter deciduous and conifer trees with suitable cavities for fisher. The LSA is predominantly in the colder and less productive SWB and BAFA BEC and as such suitable stems are unlikely to occur. Living habitat requirements for fisher are more general than marten, however; marten habitat and potential effects provide a reasonable surrogate for assessing effects on fisher in this situation. BC EAO. 2016. Application Information Requirements for the Kemess Underground Project. Published by the British Columbia Environmental Assessment Office: Victoria, BC. ERM. 2014. Kemess Underground Project: Valued Component Scoping Summary. Prepared for AuRico Gold Inc. by ERM Consultants Canada Ltd.: Vancouver, BC.	5-Aug-16
TKN-265	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Wildlife suitability modelling was conducted on the LSA that was 16,658 ha and capability modelling was conducted on the LSA that was 16,626 ha. This paragraph should explain the difference in baseline LSA and EA LSA size.	Changes in infrastructure and footprint resulted in the difference in area. The most recent LSA supported the suitability modelling and this informed the assessment.	5-Aug-16
TKN-265.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	Based on a previous response it should also be stated that there was also a different TEM data used for each modeling process. Regardless, no further action required.	Comment acknowledged.	4-Nov-16
TKN-266	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Because this assessment is focused on the effects of the ORAR it would be helpful to know how many kilometers of road (ORAR only) is found within the LSA.	A total of 11.9 km of the ORAR is found within the LSA.	5-Aug-16
TKN-267	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The legend in Figure 2.2-1 shows that grizzly bear and wolverine share an RSA while the text only mentions grizzly bear RSA.	The inclusion of wolverine in the legend on Figure 2.2-1 is an error and the text is correct; the RSA is the same for all wildlife save for caribou and grizzly bear.	5-Aug-16
TKN-268	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Because this assessment is focused on the effects of the ORAR it would be helpful to know how many kilometers of road (ORAR only) are found within the individual RSAs.	A total of 66.8 km of the ORAR is found within the RSA, 235.1 in the caribou RSA, and 66.7 in the grizzly bear and wolverine RSA.	5-Aug-16
TKN-269	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	It is stated that 'The outcome of recent aerial surveys and GPS collar studies…' but this section only lists results from GPS studies and does not mention results from aerial surveys. Can the proponent please identify if any caribou where observed near ORAR during aerial surveys.	Aerial surveys were conducted during multiple years and multiple seasons. The results are presented in section 11 of the wildlife baseline report (Appendix 15-A of the Application).	5-Aug-16
TKN-269.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	Aerial surveys are presented in Appendix 15-A but this does not show whole extent of the ORAR to be able to see if any caribou were observed adjacent to ORAR. From the response, it can be assumed that surveys were not performed along the entirety of the ORAR that AuRico maintains as the sole industrial user. As part of the ORAR wildlife monitoring program, adaptive management should be implemented so that areas of increased wildlife movement/use across the road can be the focus of management measures (e.g. signage, lowered speed limits) to reduce effects on wildlife from the ORAR. It is understood that the ORAR wildlife monitoring program will be jointly developed with TKN.	A wildlife monitoring program associated with the Omineca Resource Access Road where AuRico is the sole industrial user is identified in the Wildlife Management and Monitoring Plan (Chapter 24) It will be developed for the Project such that a record of empirical data on wildlife occurrence and direct wildlife mortality along the ORAR can be reported (see Section 24.2, Access Management Plan). Information collected in the monitoring program will be used to identify high conflict areas, which may then be used as part of an adaptive management plan to further mitigate conflicts between road users and wildlife. The Wildlife Management Plan will be further developed during the permitting phase with expected participation from TKN.	28-Oct-16
TKN-269.2	23-Nov-16	R. Robitaille, EDI	Wildlife and habitat	The Proponent response is acknowledged and anticipated TKN participation in the permit review process and development and implementation of monitoring and management plans is also acknowledged.	The comment is noted.	21-Dec-16
TKN-270	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Moose is now known as *Alces americanus* and *Alces alces* is recognized as synonym. Please make the required change in all related documents.	New species name is acknowledged.	5-Aug-16
TKN-271	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Please clarify if the proposed mountain goat UWR also falls within the general wildlife RSA since this is the RSA used for mountain goat.	Yes, previously proposed mountain goat UWRs occur in the RSA, these were legislated June 2, 2016. UWR 07-029 has polygons within the RSA. A map showing this UWR is provided in **20160706 B.1 - KUG Comment FLNRO-016, FLNRO-017, FLNRO-018, FLNRO-127, FLNRO-128, FLNRO-134_UWR_Memo**.	5-Aug-16
TKN-271.1	10-Oct-16	R. Robitaille, EDI	Wildlife and habitat	The Proponent should ensure requirements of the new UWRs are adhered to in the Wildlife Management and Monitoring Plan.	The comment is acknowledged. The new UWRs will be considered in further development of the Wildlife Management Plan during Project permitting.	28-Oct-16
TKN-271.2	23-Nov-16	R. Robitaille, EDI	Wildlife and habitat	The Proponent response is acknowledged and anticipated TKN participation in the permit review process and development and implementation of monitoring and management plans is also acknowledged.	The comment is noted.	21-Dec-16
TKN-272	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	It should be noted if any mountain goat mineral licks were found within the LSA and RSA and if any mountain goats have been observed near the ORAR.	All key wildlife features identified for the project are listed in the wildlife baseline report, Appendix 15-A of the Application. No goats have been recorded by Kemess South workers along the ORAR (AuRico - please confirm), however, FLRNO has indicated that mountain goat have been observed near Lay Creek Canyon along the ORAR.	5-Aug-16
TKN-273	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Table 4.1-1 lists other wildlife species (hoary marmot, bats, raptors, western toad etc..) but these species are not mentioned in Section 3.0. Please provide some rationale why these species are not included in section 3.0.	Any effects from construction and traffic along the ORAR on these VCs including effects of habitat loss and modification have already been realized. The additional project-specific traffic volume is not expected to have effects on these VCs.	5-Aug-16
TKN-274	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	This section discusses aquatic mammals and the last paragraph discusses hoary marmot which is not an aquatic mammal. Please remove and place this information in a more appropriate location.	Comment noted. As the report has been submitted as final, revisions cannot be made.	5-Aug-16
TKN-275	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Please clarify how staff working at the mine will access work site and if and how existing air strip will be used.	Staff working at the mine will be flown to and from the mine site, using the existing air strip. From the air strip, employees are transported by bus to the camp accommodations.	5-Aug-16
TKN-276	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	It would be useful information to include information on how often people working at the mine will be using all roads not just supply and haul vehicles.	Project staff will not be using the ORAR to access the mine site. The road will be used by environmental personnel conducting environmental monitoring activities. This will generally consist of 1 pickup truck travelling to and from monitoring stations, primarily occurring in close proximity to the mine site.	5-Aug-16
TKN-277	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	There should be an objective related to minimize the potential effect of wildlife mortality due to possible vehicle/wildlife collisions and also an objective not to impede wildlife movement.	The comment is acknowledged.	5-Aug-16
TKN-278	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The list should include complete titles or the proponent needs to add the following BMP Region 7 Omineca - Reduced Risk Timing Windows for Fish and Wildlife: Standards and Best Practices for Instream Works.	The Region 7 Omineca-Reduced Risk Timing Windows for Fish and Wildlife: Standards and Best Practices for Instream Works will be referenced for the management of instream works.	5-Aug-16
TKN-279	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The list of performance objectives should include reference to disruption of wildlife movement since this was assessed as a residual effect.	The comment is acknowledged.	5-Aug-16
TKN-280	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	It is recommended that Ungulate rutting periods and calving periods should be considered sensitive periods especially to noise (blasting) and use of helicopters near mountain goat kidding areas	The comment is acknowledged.	5-Aug-16
TKN-281	26-Jun-16	C.Coady, EDI	Wildlife and habitat	For species where information on current conditions is limited, there is uncertainty in wildlife usage of the KUG area, or where there are substantial uncertainties related to the assessment of KUG Project effects, the Proponent should develop a comprehensive wildlife monitoring and management plan to support and verify the effects of the KUG Project on wildlife. TKN should be granted a meaningful opportunity to support the development of this plan and play an active role in monitoring related to the plan (including being promptly provided with copies of monitoring reports).	AuRico continues its ongoing communication with TKN leadership regarding TKN participation in site monitoring during operations & closure. TKN members will be employed directly by AuRico for monitoring and reporting activities. TKN members will be members of the Environmental Management Committee that is expected to participate in development of EMPs (i.e. included as part of IBA).	5-Aug-16
TKN-281	10-Oct-16	C.Coady, EDI	Wildlife and habitat	It is noted that TKN and AuRico will be in discussions regarding appropriate monitoring and management plans in relation to the KUG project and that TKN will play an active role in development and implementation of those plans. EDI recommends that development of a wildlife monitoring and management plan should be part of the terms and conditions of an EA certificate based on the data or assessment limitations identified in this review.	A conceptual Wildlife Management and Monitoring Plan is presented in the EAC Application (Section 24.19) and will be further developed in the permitting phase of the Project.	10-Nov-16
TKN-281.2	23-Nov-16	C.Coady, (R. Robitaille) EDI	Wildlife and habitat	The Proponent response is acknowledged and anticipated TKN participation in the permit review process and development and implementation of monitoring and management plans is also acknowledged.	The comment is noted.	21-Dec-16
TKN-282	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Figure 15.2-1 shows that there are at least 6 proposed Mtn Goat UWR within the LSA. Please present the results of goat surveys (i.e. the location of observed goats) in relation to the proposed UWR that are within the LSA.	The surveys are identified in in Appendix 15-A of the Application, chapter 12 - Mountain Goats. Maps 12.8.1, 12.8.2, 12.8.3, 12.8.4, 12.8.5 may be used in conjunction with Map 12.8.6 to accommodate the reviewers request.	5-Aug-16
TKN-283	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	Earlier section mentioned that summer suitability mapping focused on kidding habitat but within this section there is no mention to kidding habitat attributes. The summer habitat model described in these paragraphs give the impression that only escape terrain and forage producing habitat was modeled. Please clarify.	Escape terrain and forage production are the most important attributes of summer and kidding habitat. Distance from escape terrain as well as aspect were also used to develop this model. Appendix 15-B of the Application can be referred to for details of the suitability map development.	5-Aug-16
TKN-284	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	The effect of sensory disturbance due to noise states that high use areas will be identified for avoidance by helicopters but the text does not specifically define how these high use areas will be identified, or if they will be identified within a management plan.	Management of helicopters to avoid noise disturbance to wildlife is proposed as a mitigation in the Application. This mitigation is consistent with guidelines established by the BC FLNRO, which identifies high quality habitats and distance buffers to these habitats. This information will be included in the detailed Wildlife Management and Monitoring Plan WMMP, which will be developed during the permitting stage of the Project. The WMMP will identify high use areas/high quality habitat, appropriate setback buffers and preferred flight paths for helicopters.	5-Aug-16
TKN-285	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	This section states that direct habitat loss and alteration was calculated using habitat suitability models and for mountain goat it was winter and growing season but previous section 15.4.3.3. states that summer habitat was modeled. Please clarify and make the appropriate revisions in the text.	Summer and growing season will have very similar habitat attributes for mountain goat (e.g. forage availability, escape terrain proximity and aspect) as such they can be considered synonymous.	5-Aug-16
TKN-286	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	It would be useful information to know how many hectares of high-quality habitat (winter and summer) was mapped within the proposed UWR found within the LSA. The figure that is referenced does not contain any delineated UWR. It is recommended that the proposed UWR be added to the figure like Figure 16.6-14 (not sure why ungulate winter range appears on summer habitat map).	UWR is shown in relation to winter habitat suitability on Figure 15.4-8. The amount of high-quality summer habitat that overlaps with mountain goat UWR u-7-030 within the LSA is 571.2 ha and the amount of high-quality winter habitat that overlaps the UWR is 569.4 ha.	5-Aug-16
TKN-287	26-Jun-16	R. Robitaille, EDI	Wildlife and habitat	This section should mention if any sensory disturbance would reach into proposed UWR and should mention if there is the possibility of any kidding areas being affected by any sensory disturbance.	Sensory disturbance is not expected to overlap with mountain goat UWR u-7-030 polygons within the LSA. The kidding area identified in East Cirque Creek is in an area where no Project infrastructure is proposed (p. 15-198) and sensory disturbance is also not expected to overlap with this area. It should be noted UWR has special guidance around allowable activities and does not limit blasting or traffic outside of the UWRs. Mountain goat UWR polygons that occur in the LSA (UWR u-7-030) will be considered in association with helicopter activities in subsequent versions of the Wildlife Management and Monitoring Plan.	5-Aug-16
TKN-288	26-Jun-16	C.Coady, EDI	General	An Air Quality Management Plan is presented in Chapter 24 Management Plans (Section 24.3). "Fugitive dust on unpaved roads from vehicles travelling on site roads" (Section 24.3.4.2.) has been identified as a source of dust that will be mitigated; however, dust generated from the ORAR is not specifically identified. TKN has concerns related to dust from the ORAR and potential contaminated dust accumulating on vegetation which could effect harvestable plants or wildlife habitat. Please provide information on any proposed dust management plans for the ORAR and provide information on whether there is a potential for contaminated dust to accumulate on vegetation near the ORAR.	Traffic along the ORAR would be a source of fugitive dust emissions. Dust generated along the road would originate from the road bed and would have metals characteristics of the local materials used to construct and maintain the road. Concentrate shipments from the Project would be covered such that the concentrate, which would have elevated metals concentrations, would not contribute to dust generation along the ORAR.	5-Aug-16
TKN-288.1	10-Oct-16	C.Coady, EDI	General	Due to concerns related to impacts of dust associated with increased usage of the ORAR, it is recommended that environmental plans related to the ORAR include measures to mitigate and manage dust.	Environmental Management and Monitoring Plans will be further developed in the Permitting process for the Project.	28-Oct-16
TKN-289	26-Jun-16	C.Coady, EDI	Wildlife and habitat	A framework for the "ORAR Wildlife Monitoring Program" is presented in Chapter 24 (Section 24.19.5) and includes monitoring components such as monitoring traffic volumes, wildlife observations and collisions and incidental recreational usage along the northern portion of the road, where the Proponent is the sole industrial user. The Proponent has identified that the road can be adaptively managed in partnership with the Province and TKN based on monitoring results. TKN should be granted a meaningful opportunity to be involved in developing Management and Monitoring Plans for the ORAR. Specific components of the management and monitoring should be jointly developed by TKN and the Proponent to address impacts of the road on wildlife or other concerns identified by TKN.	AuRico continues its ongoing communication with TKN leadership regarding TKN participation in site monitoring during operations & closure. TKN members will be employed directly by AuRico for monitoring and reporting activities. TKN members will be members of the Environmental Management Committee that is expected to participate in development of EMPs (i.e. included as part of IBA).	5-Aug-16

Kemess Underground Application Review - TKN Issues Tracking Table - January 6, 2017

	For Working Group Use				For Proponent Use	
ID #	**Comment Date**	**Reviewer Name / Agency (i.e. Alex Kwang, MEM)**	**Subject (See "instructions" tab)**	**Comment (Include Memo reference as applicable)**	**Proponent Response (Include Memo reference as applicable)**	**Response Date**
TKN-290	26-Jun-16	C.Coady, EDI	Predictive studies - noise	The methods for identification and selection of 45 human receptor sites and one wildlife receptor are not clear. Was any TLUS information used to support receptor site selection? Please provide more information on the selection of receptor sites.	The noise modelling considered the closest and/or potentially most affected human and wildlife receptors situated within the potential area of influence of the site. Offsite receptors and onsite receptors e.g. bunkhouses were considered. Consideration for human receptors included all permanent or seasonal residential (dwelling), commercial and industrial locations. Known hunting grounds, recreational areas, parks and campgrounds, were also considered based on data available for the Project at the time that initial noise modelling was completed. Wildlife receptors were considered based on relevant locations determined in consultation with internal technical team, based on data available for the Project. Based on this selection process, the focus of the noise modelling was one wildlife receptor (Osprey nest) and one human receptor (Project bunkhouses); the only locations within the potential area of influence of the site where impacts could occur. To maintain consistency with other technical assessments being conducted and to better understand how Project noise propagates within the potential area of influence of the site, a number of other receptor points were included in the modelling. This additional modelling step indicates that noise impacts are minimal across the study area, if any at all, and impacts are generally localised to receptors points in close proximity to project infrastructure. The Tse Keh Nay Kemess Underground Project Traditional Knowledge and Land Use Study (Appendix 20-A of the Application) was not made available until following completion of the initial noise modelling study. Thus potential noise-related effects were considered more generally within Chapter 20 (section 20.6.1.2) in the Application. More specific comparison has been completed and presented in the memo **20160706 KUG Comment HC-001, HC-004, HC-005, HC-006_Human Health _Memo.** As noted in Section 4.8.2 of the Tse Keh Nay Kemess Underground Project Traditional Knowledge and Land Use Study (Appendix 20-A of the Application), mapped features provided by the Tse Keh Nay do not pertain to site-specific locations and should only be considered labels describing the use within larger polygons. For this reason, quantitative assessment of noise impacts was undertaken in relation to traditional land use polygons within the noise modelling domain (which is 7,360 hectares).	5-Aug-16
TKN-291	7-Sep-16	SEA on behalf of TKN	Water (Quality & Treatment)	Initial Dilution Zone in Attichika Creek Background: AuRico plans to construct a diffuser in Attichika Creek to help disperse the surplus mine water during Operations. A conceptual diffuser system should be developed to demonstrate that the pipe discharge can be fully mixed with the receiving watercourse without impacting aquatic life. During the August 23, 2016 working group meeting, MOE asserted that the IDZ evaluation and design of the diffuser will be dealt with at the permitting stage. SEA agrees that detailed design can wait until permitting, but conceptual planning should be carried out during EA. Recommendation: Objectives for the mixing zone should be defined that will result in design of a diffuser system that adequately protects aquatic habitat in Attichika Creek. TKN is to provide further biological justification to the EAO to justify an initial dilution zone of 100 m or less downstream from the point of discharge.	Please refer to response to MOE-047.1. Section 14.5.2.3 of the EAC Application indicates: "The diffuser will be designed so that treated water releases avoid fish habitats in the immediate mixing zone and a section of 'no treated water release' will be established along the channel cross section including the most likely upstream migration route used by bull trout spawners." Further design of the discharge point in Attichika Creek will be consistent with this commitment.	7-Sep-16
TKN-292	7-Sep-16	SEA on behalf of TKN	Water (Quality & Treatment)	Long Term Selenium Loading Background: Selenium treatment will stop when mining stops, and there has been no protection proposed for the long-term. The predicted Post-Closure water quality is several times greater than the BC water quality guideline. At this time, there has not been a site specific water quality limit established by MOE for protection of aquatic life in Waste Rock Creek. The lack of a quantifiable water quality objective is problematic for the environmental stage of the assessment because it does not allow for appropriate mitigation measures to be developed. SEA feels is it inappropriate and inconsistent to initially use the BC water quality guidelines for assessment of impacts in the Operational Phase and then the relatively high existing conditions (~35 times the BC water quality guideline) for assessment of impacts for the long-term Post-Closure Phase. Recommendation: A selenium concentration limit should be established in Waste Rock Creek for use in the EA. The limit should be protective of the aquatic life in Waste Rock Creek. A suitably qualified biologist should be retained to develop the selenium limit. In the interim, the BC Water Quality Guideline for selenium should be used.	The elevated concentrations of selenium predicted in Waste Rock Creek are not due to the Kemess Underground Project. Predicted selenium concentrations in Waste Rock Creek during the Construction, Operations and Closure phases of the KUG project reflect existing disturbances related to the former KS Mine (please refer to memos **20160907_A.1_KUG Comment TKN-064.1_Round2-ERC_Memo** and **20160805_A.1 KUG Comment MOE-052_Water Quality_memo**). Selenium for the former KS Mine is being managed as part of the closure/post-closure phase of the KS Mine and is achieving current objectives identified in an existing effluent discharge authorization. As such, use of existing Se concentration within Waste Rock Creek for assessment of KUG related effects within Waste Rock Creek is considered to be appropriate. The BC Water Quality Guideline for Se is used at all other water quality assessment nodes within the Project local and regional study areas. The temporal boundary delineating the Closure and Post-closure phases of the Project corresponds to when it is predicted water quality will be of suitable quality for uncontrolled discharge to Waste Rock Creek (i.e., overflow via a spillway). In Post-closure, the predicted potential effect of KUG on Waste Rock Creek will be an improvement in Se concentrations, as once KUG TSF water is suitable for release it is predicted to be of better water quality than the current (existing) water quality in Waste Rock Creek. Receiving environment objectives and compliance requirements specific to Waste Rock Creek are expected to be revisited before discharge from the KUG TSF can be directed to Waste Rock Creek. Until such authorization is gained, discharge from the KUG TSF would continue to be treated and discharged to Attichika Creek as described for the Closure phase.	28-Oct-16
TKN-293	23-Aug-16	SEA on behalf of TKN	Water (Quality & Treatment)	Comment from the Aug 23, 2016 Meeting: Provide the contact seepage discharge estimates for East Cirque Creek for the Case 2 groundwater divide sensitivity.	See response in the memo **20160907- KUG Comment TKN-293_Round 2_GW Divide_Memo**	7-Sep-16
TKN-294	10-Oct-16	C.Coady, EDI	Fish and Aquatic Habi	In the Thutade Lake fish and fish habitat baseline report (Appendix 14-B), the Proponent identifies the fish tissue results of 11 adult bull trout sampled in 2014 in Thutade Lake. Fish from Thutade Lake would be the fish most likely to be consumed by Aboriginal people in the Project area. The "high consumption" human health screening value for selenium (i.e. most conservative screening value) was not exceeded in all 11 adult bull trout collected from Thutade Lake. However, current human health guidelines for mercury were exceeded in 2 out of 11 bull trout sampled in Thutade Lake. Exceedances of mercury guidelines may pose risks to human health. Chapter 14 of the Application (Section 14.4.3.3 Current Conditions) states that "Total mercury concentrations in tissue samples were suspected to be related to bioaccumulation as a result of size and age (up to 17 years old) of fish living in Thutade Lake and not related to any previous KS mining activities." There is insufficient evidence supporting this assumption. Please provide additional information as to how it was determined that elevated mercury in bull trout in Thutade Lake is not related to the KS mine, as identified in Section 14.4.3.3 of the Application. Due to the elevated levels of mercury in fish in Thutade Lake and the importance of this lake to TKN, monitoring concentrations of contaminants in fish in Thutade Lake and other appropriate areas should be part of an aquatic effects monitoring program. Waterbodies identified for fish tissue sampling should be identified based on known Aboriginal fishing locations and/or areas potentially affected by the KUG Project where fish reside.	The relationship between elevated total mercury levels in Thutade Lake bull trout and previous Kemess South mining activities can be assessed through evaluating mercury concentrations in waterbodies impacted by Kemess South activities and discharges upstream of Thutade Lake, including Waste Rock Creek and Kemess Creek. Over several years of monitoring, water quality in these creeks has shown mercury concentrations below analytical detection limits (see Section 4.5.1.12 of Appendix 11A). Waste Rock Creek, which receives seepage from the Kemess South waste rock pile, has consistently shown total mercury concentrations in tissue of resident fish and sediment below guidelines in all previous sampling events. This is also true of fish tissue and sediment samples collected from Kemess Creek. During Kemess South mine operations, federal EEM studies of fish health in Waste Rock Creek did not require monitoring of mercury in tissues of resident fish because waterborne mercury concentrations were below the threshold concentration of 0.1 µg/L; concentrations in Waste Rock Creek were consistently <0.001 µg./L (see Appendix II of Appendix 11A). Given these creeks are both considered potentially impacted by previous mining activity and connect to Thutade Lake via Attichika Creek, it would be expected that if KS mining activities were the cause of the elevated mercury concentration in fish found in Thutade Lake, mercury levels would also be high within these creeks--and in fact would be higher than those in fish in the much larger Thutade Lake receiving environment. Therefore, there is no logically valid effect pathway from Kemess South activities and elevated mercury concentrations in Thutade Lake bull trout. Bioaccumulation, through their trophic position and piscivorous diet, is the most likely cause for these elevated mercury concentrations, as seen in piscivorous predatory fish in many other lakes and as stated in Section 14.4.3.3 of the Application.	28-Oct-16
TKN-294.1	23-Nov-16	C.Coady, (J. Prive) EDI	Fish and Aquatic Habi	The thorough response is appreciated and we agree that elevated mercury in Thutade lake is most likely not a KS mine related effect. However, due to the cultural importance of Thutade Lake to TKN and that KUG mine-related changes to Thutade Lake and Attichika Creek water quality are predicted to be nominal as per the updated feasibility study modeling results we request that consideration be given to the development of a bull trout study. Since the source of elevated Hg is unknown yet consumption of contaminated fish by TKN could occur in KUG waterbodies/ watercourses determining the source and extent of contamination would support risk management for both KUG and TKN. We suggest this be included in the IBA.	The comment is noted.	21-Dec-16
TKN-295	10-Oct-16	C.Coady, EDI	Fish and Aquatic Habi	Currently, selenium exceeds fish tissue guidelines in sculpin in lower Attichika Creek, in Dolly Varden in Waste Rock Creek, and in all fish species sampled in Kemess Lake, but not for bull trout in Kemess Creek. Some of these exceedances are naturally occurring, while others are related to the impacts of Kemess South Mine. Chapter 14 Fish and Aquatics does not clearly identify predicted fish tissue concentrations of selenium or other contaminants. Chapter 15 identifies that predicted concentrations of selenium in fish tissue will not change relative to current conditions in Waste Rock Creek, however, it does not clearly identify if concentrations of selenium were modeled for other waterbodies (e.g. Attichika Creek) or for other potential contaminants that may bio-accumulate (e.g. mercury). The Application identifies that predicted water quality modeling results were used to calculate the predicted metal concentrations in fish tissue. Please provide information on what fish tissue modeling/predictions were performed and the results of those modeling predictions as they pertain to fish, wildlife and human health.	Mercury (or methylmercury) and selenium are the only two parameters where fish tissue residue guidelines are available for the protection of aquatic life or wildlife. The tissue metal concentrations associated with adverse effects in fish are not generally known for other parameters because exposures are through water, and toxicological literature associates toxicity thresholds with water concentrations of parameters (not tissue concentrations). Mercury was not identified as a contaminant of potential concern (COPC) for fish and was not further assessed in the Application. Fish tissue predictions were not made for each modelling node; the effects assessment was based on consideration of the quantitative water quality model predictions and qualitative assessment of the potential for change in fish tissue concentrations at each modelling node. Bioaccumulation models for selenium are not available for the Project, or for the former KS Mine. For KUG, concentrations of selenium were not predicted to change in fish tissue because the concentrations of selenium in water are predicted to remain below water quality guidelines in Attichika Creek and within or below the range of selenium concentrations currently observed in Waste Rock Creek related to waste rock seepage from the KS Mine. Mercury was not identified as a COPC for wildlife, given mercury concentrations in mine-related drainages (for KS Mine) and natural regional waters are very low (i.e., almost always below analytical detection limits; see Appendix 11 of the Applicaiton). A disccusion of the potential for COPCs to bioaccumulate in wildlife was provided in the wildlife chapter (Section 15.5.2.2). Risks to wildlife due to selenium exposure (either through water or through the diet) were assessed in the Application (Section 15.5.2.2), and have been addressed in other comment responses (e.g., selenium, see TKN-153). Given fish may be consumed by people as a country food, modelling of tissue concentrations in fish were done to support the human health effects assessment for the Project. Fish tissue predictions were made for all parameters identified as COPCs for human health (17 metals; Appendix 18-B). This modelling took into account current parameter concentrations in water and fish tissue, as well as predicted water concentrations in order to predict fish tissue concentrations across the human health LSA (Section 3.6.1 of Appendix 18-B, with predictions shown in Table 3.6-1 and 3.6-2 of Appendix 18-B). As shown in Section 18.5.2.5 (Tables 18.5-2 and 18.5-3, Figures 18.5-2 and 18.5-3) of the Application, risk to human health from selenium, mercury, and methylmercury (as well as the other COPCs) due to the Project were similar to the risk due to baseline conditions. No Project residual effects to the human health VC were identified.	28-Oct-16
TKN-296	10-Oct-16	C.Coady, EDI	Wildlife and Habitat	Further review has identified concerns related to the area of the tunnel and portal entrance as a barrier to movement. This "saddle area" may be a movement corridor for anmials moving east to west direction from Kemess Creek drainage to Amazay Lake area and vice versa. This appears to be the only low lying area running in this direction for several km's. Please provide more information on why this project infrastructure will not pose a significant effect as a barrier to movement considering this is most likely a movement corridor for several wildlife species	Remote cameras were deployed in the saddle area to determine it's use as a wildlife corridor from September 2013 to August 2015 (Appendix 15-A). A total of 12,005 photos were taken. Moose was the most commonly observed species with 33 moose photographed. Other observations of wildlife included three events triggered by American marten, five by wolverine, five black bears were photographed, and six adult caribou were photographed. The majority of moose were photographed in spring and summer of 2014. All caribou photographs were from spring and summer months. These observations indicate that the saddle area does faciliate movement for these species, but not a high use area. (e.g. 6 caribou observed over approximately 1,700 camera days of monitoring). The dimensions of the conveyor will be 1.6 m high by 1.7 m wide and it will run a length of approximately 3.2 km underground and 4.9 km above the surface, in a north to south direction along the ground. Only 1.2 km of the conveyor will be through forested habitat north of the Kemess South footprint (EA Application, Chapter 15, Section 15.5.1.3). A small amount of clearance below the conveyor is assumed to allow passage underneath by small animals (i.e. ~15 cm) in snow-free conditions. Within the saddle area a portion of the conveyor will be raised above the ground at a height of approximately 8 m under which mammals were assumed to be able to pass. Disruption of movement through the area was assessed qualitatively taking into consideration general information about animals' annual movements and migration behaviour, potential local movement corridors, such as the saddle area, important habitat areas and/or features and Project infrastructure and activities that may interfere with these movements (EA Application, Chapter 15, Section 15.6.1.1). Important habitat areas and/or features were either identified during baseline surveys or through habitat suitability mapping and localized movements were inferred based on natural history information for the VCs, as well as a consideration of where the high quality suitable habitat was identified per VC, in relation to the conveyor. A qualitative assessment of habitat suitability maps provided in Chapter 15 (EA Application, Chapter 15, Figures 15.4-2 to 15.4-18) indicate that the only VC's for which high quality suitable habitat exists to the east and west of the above-ground conveyor are: caribou (calving and early winter), moose (winter habitat), grizzy bear, American marten, hoary marten, and bats. Bats are not likely to experience distruption of movement given their flight will not be restricted by the conveyor. It is predicted that the larger mammals (caribou, moose, and grizzly bear) may experience some disruption of movement across the 1.2 km of the above-ground conveyor that will be through forested habitat. For caribou, the primary east-west corridor south of the Kemess South site is likely Attichika Creek, which will remain available to wildlife as a viable movement corridor. Wildlife will continue to be able to move through a portion of the saddle area, north of the saddle area where the conveyor goes underground, over the water discharge pipeline, and south of the water discharge pipeline. Caribou and other wildlife that occasionally encounter these features may still be adversely affected and incur some energetic costs. The likelihood that caribou will encounter these features is low year-round, but highest during the spring period when caribou outfitted with GPS collars were detected in low elevation areas of the LSA (EA Application, Chapter 15, Section 15.6.2.3). Relative to the other VC species, the American marten utilizes a relatively small home range; its territory size has been estimated as 5.9 and 2.1 km2 for males and females, respectively, in the Yukon (Archibald and Jessup 1984), and 6.8 and 3.7 km2 for males and females in Alaska (Buskirk 1984). It would be expected that this species also utilizes a large enough home range to move around the 1.2 km of above-ground conveyor through the forested area, or pass below the raised conveyor, therefore creating no permanent barrier. American marten is expected to pass underneath the conveyor in snow-free conditions, especially in the saddle area where the conveyor is raised to the height of 8 m. While residual effects to movement through the LSA, including the Kemess Lake Valley saddle area are expected, these are not considered to be significant to for any of the wildlife VCs for the reasons outlined above. (added this statement, please review/confirm) Archibald, W. R. and R. H. Jessup. 1984. Population Dynamics of the Pine Marten (Martes americana) in the Yukon Territory. In: Northern Ecology and Resource Management. (R. Olsen, R. Hastings, and F. Geddes, Ed.). University of Alberta Press: Edmonton, AB. Buskirk, S. W. 1984. Seasonal Use of Resting Sites by Marten martes americana in South-central Alaska, USA. Journal of Wildlife Management, 48 (3): 950-53.	4-Nov-16

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TKN-297	10-Oct-16	C.Coady, EDI	Wildlife and Habitat	The current assessment for disruption to movement for grizzly bear, marten and wolverine require further rationale. The conveyor will pose a permanent barrier to movement for the life of the mine, unlike access roads, which are semi-permanent barriers. The conveyor is located in or near high quality grizzly bear and marten habitat, which is lost or functionally lost due to the Project. Seeing how this is a permanent barrier for which no mitigation is provided, more rationale for why this is not a significant effect on movement for these species is needed. If the Proponent plans to operate the conveyor 24 hrs/day, the sensory disturbance associated with the conveyor will also most likely result in avoidance by marten.	Disruption of movement through the area was assessed qualitatively taking into consideration general information about animals' annual movements and migration behaviour, potential local movement corridors, important habitat areas and/or features and Project infrastructure and activities that may interfere with these movements, including the conveyor (EA Application, Chapter 15, Section 15.6.1.1). Important habitat areas and/or features were either identified during baseline surveys or through habitat suitability mapping and localized movements were inferred based on natural history information for the VCs, as well as a consideration of where the high quality suitable habitat was identified per VC, in relation to the conveyor. The conveyor is located near moderately high summer habitat for grizzly bear that runs from west to east (Chapter 15, Figure 15.4-11) and near a high quality winter habitat for American marten that exists to the south west of the decline entrance for the conveyor. For grizzly bear, a residual effect is expected due the disruption of movement related to the conveyor, however, this effect was characterized as not signficant due to the large size of grizzly bears home ranges and because movement will be possible through the saddle area, north of the saddle area where the conveyor goes underground, over the water discharge pipeline, and south of the water discharge pipeline.The effect of sensory disturbance is not predicted to have a residual effect on grizzly bears because noise disturbance is estimated to affect less than 4% of high-quality habitat (summer habitat) in the LSA which is only 0.021% of the assumed high-quality habitat available within the RSA. The disturbance of 36 ha represents less than 1% of a female grizzly bear's estimated home range of 5,200 ha (MacHutchon, Himmer, and Bryden 1993; Ciarniello 2006). For American marten, disruption of movement was predicted to have a residual effect, but the effect was characterized as non-significant. The magnitude of disruption of movement on American marten is characterized as low and at a local scale, and the confidence in the assessment of disruption of movement on American marten is moderate as it was assumed that American marten will be able to pass underneath the conveyor as it will be slightly elevated above the ground (i.e. ~15 cm) during snow-free periods and during winter months movement will be possible through the saddle area, north of the saddle area where the conveyor goes underground, over the water discharge pipeline, and south of the water discharge pipeline. No residual effects of sensory disturbance to American marten are predicted as the amount of habitat affected by continuous Project noise will be 1.4% of the LSA or 0.016 of the RSA, 0.3% of the LSA and 0.004% of the RSA due to blasting, and a maximum of 0.1% of the LSA or 0.002% of the RSA due to instantaneous traffic noise. MacHutchon, A. G., S. Himmer, and C. A. Bryden. 1993. Khutzemateen Valley Grizzly Bear Study. British Columbia Ministry of Environment, Lands and Parks and British Columbia Ministry of Forests: Victoria, B.C. Parks.: Victoria, BC. Ciarniello, L. M. 1997. Reducing human-bear conflicts: solutions through better management of non-natural foods. Bear-human conflict committee: British Columbia Ministry of Environment, Lands and and Parks.: Victoria, BC.	4-Nov-16
TKN-297.1	23-Nov-16	C.Coady, (R. Robitaille) EDI	Wildlife and Habitat	The Proponent response is acknowledged and TKN participation in the development and implementation of monitoring and management plans should be considered	The comment is noted.	21-Dec-16
TKN-298	10-Oct-16	C.Coady, EDI	Wildlife and Habitat	We do not agree with the approach to presenting habitat loss/alteration and sensory disturbance. The calculated area should consider the area of combined seasons for both habitat loss/alteration and reduced habitat effectiveness due to sensory disturbance. By segrating these out in the Application, it creates the perception of less habitat affected by the project than what is actually affected. This is particularly relevant for Caribou (see response to comment TKN- 086). Please discuss the total area of habitat loss, alteration and reduced habitat effectiveness due to sensory disturbance for combined seasons for all wildlife VCs. A rationale for how the proponent will approach the calculation for reduced habitat effectiveness should also be provided.	The analysis proposed by the reviewer does not align with the scope of the assessment as outlined in the AIR. The AIR specifies the specific potential effects to be evaluated, whereby 'changes in habitat – loss or alteration' and 'changes in sensory disturbance' are identified as two separate effects to wildlife VCs (p. 54 of AIR). A cumulative effect of habitat loss and reduced habitat effectiveness was not identified as a requirement of the Application. Specific to caribou (and TKN-086), additional analyses have been conducted on caribou that consider existing and future habitat loss and disturbance for draft critical habitat in the RSA. Further information can be found in memo **20161103_KUG Comments TKN_WG Meeting Sept 15 2016_Memo**	4-Nov-16
TKN-299	10-Oct-16	C.Coady, EDI	Wildlife and Habitat	For wildlife VCs that are present in the LSA/RSA year-round, information on the year-round effect of the project on habitat should be presented. Habitat suitability modeling for moose and furbearers focussed on the limited winter seasons for these species, however, because they are present year-round in the LSA/RSA, please provide some information on what project effects on habitat would be for non-winter seasons in the LSA/RSA.	The Project effects on moose and furbearers during the snow-free periods are not anticipated to be different from that evaluated in the Application. For these two VCs, the season that was selected for habitat suitability models was winter, which is the most sensitive and limiting habitat for these two species given the limited availability of food resources and the challenges of moving through the snowpack (mostly moose). Winter models have many of the same attributes as other seasons, e.g., marten winter and growing season habitat both rely heavily on the availability of mature and old growth conifer forest, and moose are dependent upon browse species in winter that also provide forage through all seasons. In addition, marten and moose are expected to use a broader range of habitats during the snow-free periods, such as the occasional use of open and younger forest types by marten (Spencer, Barrett, Zielinski 1993; Buskirk and Powell 1994) and use of productive wetland habitats by moose that are largely unavailable during winter. Therefore, both marten and moose are expected to be more widely distributed on the landscape and have a wider availability of suitable habitats during the snow-free period. Considering the above, the Application evaluated the season when the predicted Project effects to marten and moose would be of the most concern, i.e., the winter. Given the higher availability of suitable habitats for both species during the snow-free periods, it is expected that potential effects during the snow-free periods would be similar or less to that evaluated for the winter season. Buskirk, S. W. and R. A. Powell. 1994. Habitat Ecology of Fishers and American Martens. pp283-96. On file with BC Geological Survey, Ministry of Energy, Mines, and Petroleum Resources. Spencer, W. D., R. H. Barrett, and W. J. Zielinski. 1983. Marten Martes americana habitat preferences in the Northern Sierra-Nevada USA. Journal of Wildlife Management, 47 (4): 1181-86.	4-Nov-16
TKN-299.2	23-Nov-16	C.Coady, (R. Robitaille) EDI	Wildlife and Habitat	The Proponent response is acknowledged and TKN participation in the development and implementation of monitoring and management plans should be considered.	The comment is noted.	21-Dec-16
TKN-300a	26-Oct-16	SEA on behalf of TKN	Tailings and Waste Rock Management	Can I ask for further information on the volume of water stored in the KUG TMF under the new feasibility plans? I see a graph of the elevation of the TMF, but would like to understand the changes proposed in terms of volume of water stored with tailings.	The graphic illustrating the requested information was provided directly in the email to the reviewer on October 31, 2016. (Graph File name: **KUG Comment_TKN-300a_TSF Total Available Water Feasibility vs EA_graph**)	31-Oct-16
TKN-300b	1-Nov-16	SEA on behalf of TKN	Tailings and Waste Rock Management	Thank you for the information. Could you clarify for me the timing for the east dam to be active in relation to the volume graph - does the east dam begin to hold water near the year 2033 when the volume dips below about 5 M m3?	Construction of the East Dam is currently planned to start in 2026 (Year 6) and the dam crest scheduled to reach its final elevation in 2032 (Year 12). Based on current predictions, water level within the TSF would reach the trench of the dam by 2029 (Year 9), thus would begin holding water after that.	1-Nov-16
TKN-300c	10-Nov-16	SEA on behalf of TKN	Tailings and Waste Rock Management	I have looked over this information and have a follow-up request. I would like to better understand the amount of water stored behind the East dam with time. I see that in year 2029 there is about 10 Mm3 of water in the TSF and I presume that some of the volume is behind the dam while some is contained by the pit (beneath the elevation of the lower section of the dam). Could you have a graph constructed that shows the following: • volume of water stored by the east dam • volume sorted by the pit • volume of combined water + tailings for reference I am pleased to see there is less volume stored behind the dam long-term in the revised feasibility study, about 2.5 Mm3 rather than 6 Mm3.	The graph illustrating the information requested extracted from the predicted water balance model used to complete the "Effects Evaluation of Updated Feasibility Study" (File name: **KUG_Comment_TKN-300c_TSF Volumes behind Dam vs Pit_graph**) was provided on November 17, 2016.	17-Nov-16
TKN-301	1-Nov-16	C.Coady, EDI	Wildlife and Habitat	Why weren't animal observations incorporated into the original model verification process as per RIC standards? It is unclear how many/if all animal observations were used. For example in Table 1 grizzly bear fall season 100% of animals observed in habitat rated as 3-6. The associated text says 1 grizzly bear was observed in the fall. A high confidence in the terrestrial ecosystem mapping does not equal a high confidence in the habitat ratings.Verification of the habitat suitability modeling as per RIC standards was not performed.	Habitat suitability mapping ground-truthing was not completed for any of the selected species. Model assumptions were used that had been previously developed and ground-truthed for other projects in northern and north-west BC (see 20160706 KUG Comment FLNRO-121, 122_Caribou_Memo). Due to the relatively small project footprint, the associated uncertainty in following this methodology was deemed acceptable in relation to the time and financial considerations associated with completing a ground-truthing exercise specific to the suitability models. All observations of animals from the appropriate season were used although in some cases there were no observations of animals during a particular season (e.g. moose in early winter and grizzly bear in summer). Observations of sign were used for American marten as there were no observations of individuals. Observations of sign were also used for hoary marmot in order to supplement the dataset. The number of animals observed per season used for the memo were as follows; Caribou early winter (5), late winter (36), spring (11), summer (16); Moose early winter (0), late winter (3); Mountain goat winter (28); summer (19 - note, an error was found with the mountain goat percentages for summer which should be high quality habitat 95% and lower quality habitat 5% rather than the 99% and 1% as stated in the memo); Grizzly bear spring (8), summer (0), fall (1); American marten winter (22), Marmot growing (39).	10-Nov-16
TKN-302	1-Nov-16	C.Coady, EDI	Wildlife and Habitat	Incidental animal observations and signs are not the most appropriate way to assess habitat suitability mapping since not all ecosystems are visited. If the objective was to use animal observations as mapping verification then AuRico should have data for all seasons associated with each species. However, it appears there is no summer grizzly data and no moose early winter data, reducing confidence in the models.	ERM acknowledges that incidental animal observations and signs are not the most appropriate way to assess habitat suitability mapping. Baseline observations were used to visually assess validity of habitat suitability models initially developed and applied for other areas in northern and northwest BC. The memo was prepared in direct response to a specific request raised during a Wildlife Sub-working group meeting. The number of animals observed per season used for the memo were as follows; Caribou early winter (5), late winter (36), spring (11), summer (16); Moose early winter (0), late winter (3); Mountain goat winter (28); summer (19); Grizzly bear spring (8), summer (0), fall (1); American marten winter (22), Marmot growing (39).	10-Nov-16
TKN-303	1-Nov-16	C.Coady, EDI	Wildlife and Habitat	AuRico states that their habitat suitability modelling assumptions for late winter caribou habitat were based on knowledge of caribou behavior in other project areas which prioritize high elevation habitats. It is then stated that "However, the local caribou in the Kemess Project LSA tend to use low elevation areas during the late winter as few of the high elevation areas are snow blown and high snow…" Why weren't the suitability ratings tweaked to represent this local variance which is stated in Section 11.8.1 of Appendix 15-A?	ERM did used baseline observations of animals collected by Ardea to visually determine if modelling results looked appropriate as presented in Figures in Appendix 15-B. At the time the suitability modeling was completed, the local site knowledge of caribou use in area was not incorporated. Additional effort is being made to determine if wildlife assessment plot data is available and can be used to verify suitability mapping results. AuRico and ERM understand this information may result in greater confidence in the habitat suitability modelling results and effects assessment conclusions; but emphasize that additional information regarding model verification would not influence the conclusions of no significant effects to wildlife. Any additional information that can be obtained to verify habitat suitability model results will be shared and reviewed with the TKN and would be considered in development of a wildlife management plan to support the Mines Act permitting process.	10-Nov-16
TKN-304	28-Oct-16	H. Van de Vosse, EDI	Wildlife and habitat	In the ERM response, the methodology section states that the Kemess South existing infrastructure and Project infrastructure were considered the direct zone of impact and the indirect zone of impact was created using the ECCC's 500m recommended disturbance buffer. When looking at Figures 4.1-1 and 4.1-2 the terminology used in the legend does not match the terms used in the methodology. The figures do not show the direct zone of impact as described in the methodology section and seem to show two zones of indirect impacts. This inconsistency makes it difficult to link the information shown in the Figures with the information provided in Tables 4.1-1 and 4.1-2.	The noted inconsistency is acknowledged. As explained in Section 3.1, Kemess South existing infrastructure and the Project infrastructure were considered direct zones of impact. Other existing infrastructure such as the ORAR was also considered a direct zone of impact. On Figures 4.1-1 and 4.1-2, the Kemess South infrastructure is represented by the dark gray polygons and labelled as "Existing Infrastructure" in the legend. The Project infrastructure is represented by the light gray polygons and labelled as "Proposed Surface Infrastructure" in the legend. In Section 3.1 it also states that ECCC's 500 m recommended disturbance buffer was used to identify an indirect zone of impact. In Figures 4.1-1 and 4.1-2, the Kemess South zone of indirect impact is shown by the orange buffer of the dark gray polygons and labelled as "500 m Existing Disturbance Buffer". The Project zone of indirect impact is shown by the red buffer of the light gray polygons and labelled as "500 m Buffer of Proposed Infrastructure".	21-Dec-16
TKN-305	28-Oct-16	H. Van de Vosse, EDI	Wildlife and habitat	The methodology does not state how caribou observations that were on or very close to zone boundaries were dealt with.	This comment was addressed during the caribou sub-working group meeting on November 25, 2016. Point locations of caribou were overlaid on polygons of infrastructure and infrastructure buffers. The ArcMap command "Intersect" was used to determine which observations occurred within either the infrastructure areas or the buffered infrastructure areas. Some of the point locations on Figure 4.1-1 look close to the edges of these areas but that is due to the map scale, if the scale of the map were larger then it would be more obvious which points fell outside the areas in question.	21-Dec-16
TKN-306	28-Oct-16	H. Van de Vosse, EDI	Wildlife and habitat	The methodology section states that the season of interaction with caribou was determined and grouped according to season and year however the legend for Figures 4.1-1 and 4.1-2 indicates that the population study (aerial surveys from regional population studies Sittler et al. 2015) is not shown by season.	The population study data from Sittler et al. 2015 used to inform the memo did not include the date of observation. As of December 12, 2016 the full dataset from Sittler et al. (2015) has still not been received by AuRico from the BC government. As such, the season of the observation from this dataset could not be included.	21-Dec-16
TKN-307	28-Oct-16	H. Van de Vosse, EDI	Wildlife and habitat	The first two sentences in the last paragraph of page 7 seem to contradict each other. EDI's understanding of the first sentence is that April was added to the spring season for the habitat suitability modelling for this exercise but then the second sentence states that the habitat suitability modelling was specific to calving and April had not been included for the spring calving model.	This comment was addressed during the caribou sub-working group meeting on November 25, 2016. April was not included when mapping suitable habitat for caribou calving. However, for the caribou re-assessment memo, April was considered a spring month and observations were included for the results of the analyses for the response to ECCC-091.1. In the memo text "This differed slightly compared to the caribou observations shown in Appendix 15-B for the seasonal habitat suitability modelling as April was added to the spring season for this exercise." "This exercise" was meant to refer to the caribou re-assessment analyses.	21-Dec-16
TKN-308	28-Oct-16	H. Van de Vosse, EDI	Wildlife and habitat	The result section states that only five locations of caribou observations overlapped Kemess South infrastructure areas and that there were no locations that overlapped proposed Project infrastructure (Table 4.1-1 and Figure 4.1-1). When reviewing Figure 4.1-1 there are two points (Kemess baseline summer points) that appear to be on the boundary line of a proposed surface infrastructure (most northern new infrastructure) and there are more than five points within the direct zone of impact (proposed surface infrastructure and existing infrastructure). Tables 4.1-1 and 4.1-2 have a column entitled "Total Locations" but there does not appear to be an explanation on how the total locations were calculated. For example, the Spring 2013 numbers in the tables show that the total locations is equal to 107 but if you add all the spring 2013 locations from both tables it only equals 45 locations.	This comment was addressed during the caribou sub-working group meeting on November 25, 2016. Point locations of caribou were overlaid on polygons of infrastructure and infrastructure buffers. The ArcMap command "Intersect" was used to determine which observations occurred within either the infrastructure areas or the buffered infrastructure areas. Some of the point locations on Figure 4.1-1 look close to the edges of these areas but that is due to the map scale, if the scale of the map were larger then it would be more obvious which points fell outside the areas in question. In Tables 4.1-1 and 4.1-1 the Total Locations refer to all of the locations of observations within the entire LSA for the given year and season. Total Locations were compiled from the Kemess baseline data (Appendix 15-A of the Application) and GPS collar data (Figure 15.4-1 of the Application). The spring 2013 observations that total 45 locations are 3 within the Kemess South Infrastructure area (i.e. Direct Zone of Impact, Table 4.1-1), 5 within the 500 m buffer of Kemess South Infrastructure (Table 4.1-2) and 37 within 500 m of other existing disturbance (e.g. roads, Table 4.1-2). The other 62 locations from spring of 2013 are beyond the existing infrastructure and 500 m buffered areas of that infrastructure. AuRico apologizes for the confusion with the title on the second page of Table 4.1-2 indicating Kemess South 500 M Buffer as it should have been replaced with the title in column 1 of "Other Existing Disturbance 500 m Buffer (i.e. roads).	21-Dec-16

Kemess Underground Application Review - TKN Issues Tracking Table - January 6, 2017

	For Working Group Use				For Proponent Use	
ID #	**Comment Date**	**Reviewer Name / Agency (i.e. Alex Kwang, MEM)**	**Subject (See "instructions" tab)**	**Comment (Include Memo reference as applicable)**	**Proponent Response (Include Memo reference as applicable)**	**Response Date**
TKN-309	28-Oct-16	H. Van de Vosse, EDI	Wildlife and habitat	The first sentence of the last paragraph on page 9 states that by using the ECCC's recommended disturbance buffer of 500m, there were 29 locations or 17% of the locations from the same year and season that were within the Kemess South disturbance area and 89 locations or 52% within other existing disturbance within the LSA (Table 4.1-2 and Figure 4.1-1). The terms used in paragraphs versus the terms used in the corresponding figure do not appear to correspond. It is unclear how the percent location data was calculated. A solution might be to restructure the sentence to clarify that there were 29 locations from different years and seasons as shown in the results table if this information is to be used in any other reports or memos.	In Section 3.1 it also states that ECCC's 500 m recommended disturbance buffer was used to identify an indirect zone of impact. In Figures 4.1-1 and 4.1-2, the Kemess South zone of indirect impact is shown by the orange buffer of the dark gray polygons and labelled as "500 m Existing Disturbance Buffer". The 17% within the Kemess South disturbance area (i.e. zone of indirect impact) was calculated by adding the 12 observations within 500 m of Kemess South in candidate high elevation winter/summer range and 17 observations within 500 m of Kemess South in candidate low elevation winter range (total of 29) and dividing by the 166 total observations in the LSA (the first page of Table 4.1-2 and in the Sub-total rows). Similarly the 52% within the 500 m buffer of other existing disturbance was calculated by adding the 30 observations in candidate high elevation winter/summer range and 59 observations on candidate low elevation winter range (total 89) and dividing by the 172 total observations within the LSA. It should be noted that these areas would no longer be considered candidate critical habitat as the proposed LPU for the Chase herd will not be used and instead the existing LPU for the Chase herd	21-Dec-16
TKN-310	28-Oct-16	H. Van de Vosse, EDI	Wildlife and habitat	The text associated with Table 4.1-2 and data within the Table appear to be inconsistent. For example the table shows a total of 7 female caribou were observed while the text states that 6 female were observed. The table has a subtotal of 28 animals observed but only shows 22 adults and 2 juveniles, equaling 24 animals observed.	The text should have stated 7 female caribou instead of 6, this oversight is acknowledged. As indicated in the footnote of Table 4.1-2, "The number of animals per age class and sex was not consistently specified in the datasets." Therefore, the column "# Animals" shows the total number of animals observed but how many of these were males, females and juveniles was not always possible to determine from the datasets.	21-Dec-16
TKN-311	28-Oct-16	H. Van de Vosse, EDI	Wildlife and habitat	The text on page 8 states that areas disturbed by fires were included in a merged spatial layer and could not be separated from buffers used for disturbed areas. Therefore they are not included in the results of this analysis for the current Chase LPU area. This seems contradictory since Table 4.2-1 under the Project or Activity heading lists Fires in the last 40 years.	The area altered due to fires in Table 4.2-1 is the area within the caribou RSA that is outside the current Chase LPU. It couldn't be reported separately for the current Chase LPU since it was a merged data layer received from ECCC.	21-Dec-16
TKN-312	28-Oct-16	H. Van de Vosse, EDI	Wildlife and habitat	Table 4.2-1 shows the results for each project or activity split by both LSA and RSA in the same table and it appears that the habitat loss and habitat alteration for each project activity within the LSA is not included with the habitat loss or habitat alteration within the RSA. For example only 394.4 hectares are listed under the RSA habitat loss by Mines and Mineral Exploration but 1,337 hectares are listed under the LSA habitat loss by Kemess South Area.	The sub-totals from the LSA and RSA are added together for the final total in the last row of Table 4.2-1. A revised Table 4.2-1 was given to the attendees of the caribou sub-working group meeting on November 25, 2016 and provided in the revised memo **20161215_KUG Comment_ECCC-091.1, 093.1, 097.1, 098.1, 115 Memo** to EAO on December 15, 2016.	21-Dec-16
TKN-313	28-Oct-16	H. Van de Vosse, EDI	Wildlife and habitat	Table 4.2-1 has a total area heading and it seems that this is the result of the habitat loss area added with the habitat alteration area. For example, total area of the LSA (168.3 ha) equals habitat loss (97.6 ha) plus habitat alteration (70.7 ha). But under the RSA areas the total does not add up to the numbers listed. For example, the total area of the Roads (45,967.4 ha) does not equal habitat loss (5,872.2) plus habitat alteration(45,967.4 ha) but only equals the habitat alteration total. Additionally the total reservoir area is not carried over the total column.	The discrepancies are acknowledged. A revised Table 4.2-1 was given to the attendees of the caribou sub-working group meeting on November 25, 2016 and provided in the revised memo **20161215_KUG Comment_ECCC-091.1, 093.1, 097.1, 098.1, 115 Memo to EAO** on December 15, 2016.	21-Dec-16
TKN-314	28-Oct-16	H. Van de Vosse, EDI	Wildlife and habitat	The text in Section 4.3.1.2 states average and maximum number of caribou per season observed within 500 m of existing disturbance in the LSA (see Section 4.1) are shown in Table 4.3-2. Table 4.3-2 shows that a maximum of 8 caribou were observed during the spring season within 500 m of Disturbed Areas while a different Table 4.1-2 shows a total of 12 animals observed during all spring seasons. Also the habitat areas in the table in Appendix B-2 and other disturbance tables (4.2-1) within the memo have different values. There appears to be discrepancies between tables showing similar information.	The number of caribou affected was estimated on an annual basis. The maximum number of caribou observed during the spring was 8 in 2007 (Table 4.1-2 page 11) within 500 m of Kemess South infrastructure and the average number of caribou observed during the spring within 500 m of existing and proposed infrastructure was 2 (Table 4.1-2 page 15). It isn't clear where in Table 4.1-2 it is stated that a total of 12 caribou were observed during all spring seasons as the total of all spring seasons within 500 m of existing and proposed infrastructure is 14 and only within 500 m of Kemess South it's 11. The average and maximum within a single year were used for calculations to determine the estimated number of northern mountain caribou and Thutade herd caribou affected by the Project on an annual basis per season (Section 4.3.1.2). The estimates of habitat disturbance for the LSA in Appendix B-2 used the 500 m disturbance buffers recommended by ECCC while the estimates in Table 4.2-1 did not; they followed the methodology used in the wildlife cumulative effects assessment of the EAC Application.	21-Dec-16