

Stk'emlupsemc te Secwepemc Nation (SSN)



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Amanda Watson SSN KGHM Ajax Tmicw Coordinator Stk'emlupsemc te Secwepemc Nation 1030 Trans Canada Skeetchestn, BC VOK 2J0

RE: KGHM Ajax Mine Project Environmental Assessment Application Review

Dear Ms. Watson,

Please receive the attached summaries and tracking tables for Stk'emlupsemc te Secwepemc Nation review of the KGHM Ajax Mine Project Environmental Assessment Application Review (the Project). Our report identifies comments, inadequacies and concerns emerging from technical review in support of Stk'emlupsemc te Secwepemc Nation rights and title mandate.

VALUED COMPONENT SELECTION

The Project has neglected to address a number of valued components used by Stk'emlupsemc te Secwepemc Nation as country foods, cultural significance and economic importance were not included in the biophysical assessment (i.e. subsistence harvest, The Trout Children Stseptékwll wildlife, medicinal plants, furbearers). The lack of inclusion of the valued components is not in keeping with either Canadian Environmental Assessment Act (CEAA) and British Columbia Environmental Assessment Act (BCEAA) mandate or Project objectives.

Valued component species selection is largely unsubstantiated, particularly when species have overlapping niches. There is weak or lacking justification on why specific species were selected, including biological or ecological reasoning for the selection of these species. The information provided does not provide any rationale or defense as to why the species was selected as a valued component, what habitats are required for various life requisites, and if these habitat requirements are met at all in the Local Study Area (LSA) or Regional Study Area (RSA), which would all speak to why this species was even considered or assessed. Habitats required for breeding differ significantly to those required for either foraging or hibernation. Frequently these habitats are a significant distance from one another, particularly with the increasing fragmentation by roads and development. The report section needs to speak to all life stages of selected valued components.

Examples of unsubstantiated species selection include spadefoots and chorus frogs when their breeding grounds often are the same ponds. It is questionable as to why select western toads and chorus frogs when these species are found in the same ponds? If selecting Columbian spotted frogs, why not long-toed salamanders? These salamanders are typically higher elevation and stream-dwelling, while spadefoots tend to be only in ephemeral ponds. Further outstanding questions include why rubber boa,



gopher snake, racer, and rattlesnake were assessed while there is no consideration to northern alligator lizard, which are likely also present and not mentioned? Why are two garter snakes (and neither are listed) considered valued components? And why are the four selected reptile species examined when they frequently cohabitate, and use similar habitats for foraging?

Threatened or endangered species are frequently not suitable indicator species. This is often due to either the absolute abundance / presence of said species is not well documented or understood sufficiently to measure the impacts of the mine. Further, the species is likely occur in small habitat patches, and not evenly throughout the entire RSA. The application needs to explain how species that will provide indication of affected ecosystem impacts are related to project-specific activities and mine site infrastructure.

PROJECT SPATIAL BOUNDARIES

Biophysical sampling for the KGHM Ajax Mine Project Environmental Assessment did not capture required spatial boundaries within the limited LSA. Significant areas of the study area were not included in the assessment of valued components. The Project's Environmental Assessment provides an inadequate study design to assess species impacts at required spatial scales as the LSA does not account for patch size of target vectors. It remains to be explained how the selected spatial boundaries were determined for assessing potential impacts to valued components. It is necessary to define and use ecologically relevant spatial boundaries for sampling that can accurately describe potential effects from the Project. Appropriate selection of spatial boundaries is critical as individuals, populations, and communities all respond differently to potential impacts.

The LSA is where direct, immediate, and project-specific impacts are observed. Typically, the LSA is an area which includes all infrastructure (e.g. roads, tailings, mill, pits etc.) and sensory disturbance buffer around the Project area. Litany of literature points to impacts from mine operations inhibiting / influencing wildlife movement, habitat use and behaviour. With respect to fish and fish habitat, the lower reaches of Peterson Creek (macroreaches 1-4) were not included within the LSA. Further, the City of Kamloops was not considered in the RSA despite downstream aquatic habitat being directly influenced by effects that occur upstream. The Project LSA should include:

- the physical Project footprint as well as possible sources of contamination and on-site hazards; and
- the temporal and spatial extent of sensory disturbances from the Project.

The RSA is regional, which indicates this should be based on watershed or wildlife species home ranges (e.g. fish population movements, ungulate winter range, etc.). The area's spatial boundary is used to assess residual and cumulative impacts to the landscape and associated ecosystems and wildlife. Establishing an appropriate RSA that accounts for cumulative impact assessments is critical to transparent and defendable environmental assessment.





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Inappropriate methodology has been applied to Terrestrial Ecosystem Mapping of the Project Study Area. Terrestrial Ecosystem Mapping (TEM) forms the baseline of habitat classification within the Project RSA. A well-developed TEM sampling plan must considers spatial boundaries, ecosystem stratification, scale, survey intensity, and survey detail. TEM sampling completed for the Project differed widely in intensity (full, ground, visual) between plots. Finally, the ratio of full plots: ground inspection: visual identification for BGxw1 does not confirm to the RISC TEM Standards for Project Areas between 5,000 ha and 50,000 ha.

The Project TEM is incomplete, unverified and questionable and yet forms the foundation of baseline conditions assessment and habitat mapping. Without establishing an accurate TEM model of the Project area, it is not possible to develop and obtain information of existing ecological units. The TEM study area must be defined by Project objectives including, but not limited to, assessments of rare and sensitive ecosystems, fish and fish habitat, and wildlife habitat. It is imperative that TEM models be completed specific to targeted fish and wildlife spatial boundaries.

Very few TEM plots were completed along the transmission and waterline corridors which assumes no impacts via human activity, physical disturbance, and that existing infrastructure and operations are having no impact on the environment, habitat use by wildlife, etc. TEM plot sampling in Fig 4.2 of the report yielded that road accessibility and water corridors played a strong role in field sampling efforts. Sampling units were grouped in concentred areas and not equally distributed across the Project landscape. Characterization of vegetation by TEM, should be carried out as "proportional representation", where an equal number of each type of polygon / habitat type is sampled for accuracy and to increase resolution of the areas in question. Transects are not an adequate nor efficient form of surveying TEM data capture and largely restricted to survey effort on a given day. It is unlikely that there is sufficient information collected in regards to the vegetation of the area to adequately assess composition and potential impacts.

Habitat Suitability Models for ecological communities at risk, grasslands, and wildlife vectors were based on a flawed TEM approach that ignores Project objective spatial boundaries and is founded on inaccurate methods (see Chpt. 6.8-A, Item 3.1). Accurate delineation of ecological systems is critical for habitat suitability modelling for targeted wildlife valued components. Determination of wildlife habitat associations, and subsequent habitat suitability, requires documenting habitat types at the scale of wildlife vector home ranges.







For a variety of valued components, there is an acute lack of rationale for non-random sampling protocol, with little stratification between identified biogeoclimatic subzone variants, and no replication between years. Further, biophysical sampling did not capture required spatial boundaries and significant areas of study within the limited LSA (e.g., ecological communities at risk and grasslands). Sampling protocol and assessment methods did not follow approved BC RISC Standards components.

Sampling effort consistency and replication (both among and between years) are deficient for a variety of valued component sampling programs (i.e. terrestrial invertebrates, amphibians, large mammals). Some surveys were only completed for a single year, and only during one period of the active season (i.e. road surveys). Timing of surveys does not capture major movement of several wildlife vectors (i.e. Great Basin spadefoots). Description of wildlife vector survey timing does not adequately describe conditions at the time of surveys, nor where the surveys took place (habitats, specific areas, routes of transects, justification for those transects etc.). Towards this, the proponent has not provided sufficient rationale for avoiding sampling and effects assessment of wildlife vectors including terrestrial invertebrates, amphibians, reptiles, and birds (i.e. Nevada skipper, Great Basin Spadefoot, northern rubber boa, Columbia sharp-tailed grouse). Finally, the avoidance of SAR sampling is incompatible with Project Environmental Assessment objectives.

Methods do not show that surveys were completed sufficiently to adequately assess for presence and habitat suitability of the wildlife vectors (i.e. fish, terrestrial invertebrates, amphibians, ungulates). The reviewer cannot determine accuracy of information based on methods used, and there is significant doubt in accuracy of information and data provided due to vagueness and inaccuracies in species information and survey methods employed. Specific to fish and fish habitat, transects should be reassessed providing they are located on appropriate habitat types. A detailed analysis should be completed to determine impacts on fish and fish habitat as per "Assessment Methods for Aquatic Habitat and Instream Flow Characteristics in Support of Applications to Dam, Divert, or Extract Water from Streams in British Columbia" by Lewis et al. 2004. Analysis should include real time hydrology data from potentially effected macroreaches of Peterson Creek.

The Project's Environmental Assessment Application has not provided a description of habitat suitability polygons including what these areas are, where they are, why they are ranked high/moderate, what aspects were considered, where they are in the LSA, and how much of the area this entails. More information and substantive analysis is required for habitat suitability mapping, illustrations of areas, matrix of criteria used to delineate "high" "moderate" or "low", how these areas were verified prior to field surveys, what features were considered for the various life requisites. The proponent has failed to provide a matrix of habitat suitability, identifying why areas were ranked "low", "moderate" or "high", and provide rational/defense as to the rankings.







Assessment of cumulative Project impacts on wildlife valued components does not include sensory disturbance considerations. Spatial boundaries for several wildlife surveys fails to account for sensory disturbance (i.e. reptiles, birds). Reptile vector spatial boundaries are insufficient to address potential sensory impacts. CEAA and BCEAO assessment protocol requires the provision of methodology and results for all Environmental Assessment investigations of sensory disturbance to wildlife valued components. With respect to both sensory and physical disturbance, the Project Environmental Assessment application fails to adequately assess potential mine impacts of noise and vibration from blasting and pile driving to vulnerable life history traits of wildlife valued components. Sufficient and defendable modelling for Project impacts to fish and wildlife eggs and embryonic development has not been developed. Raw data for review of modelling study design and assessment has not been provided.

The application should detail the modeling and effects assessment of the potential impacts of open tailings ponds to migratory and wintering birds. The assessment should also provide mitigation planning to adequately address avian abatement on mine tailings ponds. The South Thompson River is a federally recognized Important Bird Area (IBA, BC176) and an important staging and wintering ground to a variety of waterbirds.

CUMULATIVE IMPACTS ASSESSMENT

It is required that Project spatial boundaries required to accurately evaluate sensory disturbances to valued components are adequate for incorporation into subsequent cumulative effects assessments. Sensory disturbance assessment are lacking for terrestrial invertebrates, amphibians, reptiles, mammals, and birds.

Historical mining activity and its effect on water quality and fish habitat is a key residual effect that should be included in the cumulative effects assessment along with agriculture and ranching. The Ajax east and west mine pits and associated waste should be labelled here, and an effect rating based off cumulative effects assessments. Further, it is important that data capture collected in the LSA be examined as "baseline" through RSA control studies and not a relic of existing disturbance.

The cumulative effects of flow reduction (i.e. mine, climate change, agriculture, ranching) and spikes in water quality (acute spikes <24hrs - not monthly average exceedances) should be investigated together. The implications of multiple components reducing water flow in Peterson Creek coupled with acute exceedances in water quality potentially provide unique and important negative impacts. Potential additional effects on water quality, water quantity, climate change (flow reduction), and aquatic habitat loss (fish, benthics, periphyton) should all be assessed throughout the drainage below Jacko Lake (specifically downstream of Highway 5A). Residual cumulative effects may pose risk to the Peterson Creek aquatic environment including salmon and trout species.





COMPENSATION PLAN

Ephemeral wetlands provide life history and trophic structure important to endemic organisms of the Thompson-Nicola region. The unique biodiversity of the area is closely associated to small mesic areas scattered across the region. It is imperative that compensation efforts mimic the ecological function provided by small ephemeral systems as opposed to deep lake water systems or riparian areas. Given this, what is the Project's Rare and Sensitive Ecosystem Compensation Plan?

There is little certainty regarding the potential for the successful reclamation of bunchgrass and ponderosa pine grasslands unique to the Thompson-Nicola region. There is tangible concern that the loss of native grasslands, including Red and Blue listed communities, cannot be mitigated and may result in significant cumulative and trophic impacts.

ENVIRONMENTAL ASSESSMENT APPLICATION CONCLUSIONS AND INFERENCES

Our concerns with the Environmental Assessment Application's conclusions and inferences include the following.

"During the bird survey in May 200... rock outcrop was revisited in August... Classified as a snake hibernaculum". The presence of one snake and a shed does not make a hibernaculum. This potential den was found likely after dispersal of any snakes (unless there was gravid females), and not revisited when snakes would have returned for hibernation (i.e. late September to mid-October). The potential for this "den" to be a "den" is not adequately substantiated based on the methods and description provided. The site is likely a summer thermal spot based on the shed and presence of one snake near the feature. Caution is advised against claiming this as a "den" based on limited and unconfirmed information.

"The eggs hatch within 2-4 days and the tadpoles can metamorphose in as little as 36 days after hatching". This is incorrect. In fact, spadefoot metamorphosis is a hormonal response to pond drying / water temperature. It is driven by the activation of the thyroid and interrenal axes, the hormones of which control metamorphosis. Furthermore, this response is rapid, occurring within 48 h after exposure to the desiccating environment. Hatching can occur within 24 hours and metamorphosis in Great Basin spadefoots has been recorded to occur in under 2 weeks.

Discussions that omit fish habitat downstream of LSA/macroreach 5 are misleading. This information provided should note that a small recreational fishery does exist downstream of the LSA and it supports rainbow trout (macroreaches 3 and 4 of Peterson Creek). The Peterson Creek fish population is reliant on downstream migration of fish from Jacko Lake during freshet or flood flows. It is planned that fish will not pass downstream of the proposed dam and diversion structure at the outlet of Jacko Lake as the dam structure will not have a spillway. This plan will result in isolation of the resident population of trout located in macroreaches 3 and 4 of Peterson Creek. Good habitat exists downstream of Jacko Lake within macroreach 4 that can support a resident trout population with population supplementation input from



Jacko Lake. Therefore, it is inherent that habitat and fish movement is maintained or improved upstream of macroreach 4 in order to ensure that fish can pass from Jacko Lake down to macroreach 4 in order to support the existing resident fish population. Further, the lower reaches of Peterson Creek (macroreaches 1-4) are not ephemeral as described in the Project application.

The Environmental Assessment Application concludes that flows in Peterson Creek are low and the difference from reduction by the mine is minor and will have negligible effect on fish. This is an assumption as effects are based on predicted flows from directly below the mine with a few physical on site measurements. A decrease in water quantity could result with impacts on the fish population within the mid portion of Peterson Creek, especially between the dam site and Highway 5A where there are gentle stream gradients (1-3%). A further reduction in water quantity coupled with other effects, including exceedances in water quality, could impact downstream resident fish and other aquatic biota. Further assessment is required using methods described in Lewis et al. and supported by hydrometric data collected within potentially effected reaches (macroreaches 1-4).

"Indirect habitat loss in Peterson Creek downstream of the Project area from flow reduction associated with Project footprint and contact water" is rated as "Not Significant (minor)" is not based on sufficient data. Real time hydrometric monitoring must be collected within downstream reaches of Peterson Creek in order to accurately estimate downstream reach flow levels and potential flow reduction impacts on rainbow trout, salmon, invertebrates and primary productivity.

Direct fish and aquatic habitat loss in Peterson Creek and Jacko Lake rated as "Not Significant (minor)" is inaccurate. This is not factual. This is a Significant effect for both Peterson Creek and Jacko Lake. The potential impact will cause serious harm to a recreational and aboriginal fishery. Residual effects on fish habitat in Jacko Lake and Peterson Creek will be significant and major. The spiritual significance of Jacko Lake and Peterson Creek was not recognized under the Environmental Assessment application as an effect on the SSN.

It has been requested that the proponent provide rationale and certainty for the following Environmental Assessment Application conclusions:

- "Spadefoots could potentially breed in many small ephemeral waterbodies throughout the Local Study Are, but will only be successful at site where water is retained for at least 36 days after eggs are laid". This is incorrect. Maturation in spadefoots is rapid, occurring within 48 h after exposure to the desiccating environment, which means hatching can occur within 24 hours, and metamorphosis in Great Basin spadefoots has been recorded to occur in under 2 weeks.
- "The loss of suitable breeding habitat may result in a negative impact to various species. Two Blue-listed amphibians, Great Basin spadefoot and western toad, are known to reside in the area, and a reduction in habitat may impact these species locally and regionally. Habitat loss is considered not significant (moderate) for this species group for Project-related residual effects as 48% of potentially suitable breeding habitat will be removed."



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- "Loss of small wetlands and water bodies throughout the LSA will have a residual effect on migratory birds but effects at the population level are unlikely, since a higher density of species will be supported by the larger waterbodies. Habitat loss for Common Nighthawk and Long-billed Curlew can be partially mitigated by revegetation of sites within the Project IF during operation. These species use disturbed, anthropogenic habitats and are therefore more resilient."
- "A residual cumulative effect of chemical hazards may occur for migratory birds, particularly
 waterfowl. Waterfowl will be exposed to chemical hazards during migration through contact
 water in the tailings storage facility. The tailings storage facility at the New Afton Mine may also
 expose migratory birds to chemical hazards in the RSA. As a large amount of more suitable habitat
 occurs in the area, and exposure during migration is expected to be limited, the magnitude of the
 chemical hazard is considered minor. These chemicals can persist on the landscape into the far
 future, and will be continuous. In the long-term, the chemical hazard effect will be reversible."
- "Sensory disturbance will occur for American badger as a result of Project blasting noise. Habitat avoidance (120 dB) resulting from noise may affect 5 to 14% of suitable habitat in the LSA (Table 6.17-9). Energetic costs may be experienced (108 dB) in 28 to 42% of the Suitable habitat in the LSA (Table 6.17-9, Figure 6.17-13). Three of the 26 badger digs are within the 120 dB blasting radius and 12 additional digs are within the 108 dB radius in the LSA. The effects of ground vibrations on badgers are not well understood, making a prediction of the impact of this activity on this species difficult. The potential effect of noise sensory disturbance on badgers is anticipated to be minor."
- "The loss of American badger habitat may result in a negative impact to this species. As badgers are Red-listed (extirpated, endangered, or threatened) in BC, the loss of suitable habitat could impact populations locally and regionally. Habitat loss is considered Not Significant (Moderate) for this species for Project-related residual effects as about 28% of suitable habitat in the LSA will be removed."
- "Disruption of badger movement may result in increased energy expenditures and decreased reproductive success for this species. Disruption of movement is considered Not Significant (Moderate) for Project-related residual effects as fragmented habitats may decrease badger populations, but individuals may shift home ranges in response to a disturbance. Disruption of movement is considered Not Significant (Minor) for this species for cumulative residual effects as an abundance of unfragmented grassland habitat exists southeast of the Project, and that habitat does not have any anticipated projects/activities."



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UNCERTAINTY DUE TO LACK OF INFORMATION IN THE ENVIRONMENTAL ASSESSMENT APPLICATION

Insufficient information regarding Jacko Lake – noise/vibration disturbance from pit excavation. Blasting will be managed to avoid mortality. However, there is a lack of information on non-mortality related effects from noise/vibration disturbance on the aquatic community (invertebrates and fish) of Jacko Lake. Further investigation is required. Further, there is insufficient information regarding non-mortality related effects from noise/vibration disturbance on the aquatic community (invertebrates and fish) of Jacko Lake. Further investigation is required. Further, there is insufficient information regarding non-mortality related effects from noise/vibration disturbance on the aquatic community (invertebrates and fish) of Jacko Lake. Alternation is required.

The Environmental Assessment Application states that indirect habitat loss/sub lethal effects on fish and primary productivity in Peterson Creek downstream of the Project area from flow reduction associated with Project is "Not Significant (minor)", is based on insufficient information. Acceptable and defendable analysis based on hydrometric/hydrological monitoring from lower Peterson Creek is required.

Residual and residual cumulative residual effects are "Not significant (minor)" on fish habitat in Peterson Creek due to primary productivity decreases and flow reduction. This is an assumption. Further information to support studies on flow reduction and effects on fish, fish habitat and primary productivity is required. Current flows in Peterson Creek macroreaches 1-4 should be assessed (hydrometric data collection) to support any flow modelling within these reaches to assess residual and residual cumulative effects.

As this area is already impacted by previous human activity, increased sensitivity should be applied to Peterson Creek downstream of Jacko Lake, the Thompson River and areas downstream of the Thompson River. This is particularly important to both the local recreational and aboriginal fishery.

What is the prescribed mitigation strategies within the Environmental Management System to protect terrestrial and aquatic resources interacting with the Project's pit lake. The Environmental Management System does not provide mitigation options and assessment of certainty for residual impacts.

Explain rationale and certainty: "The pit lake model potentially over-estimates water quality as it does not account for attenuation mechanisms common in natural lakes that have a high rate of biological activity. Biological productivity can be enhanced by organic additions and fertilization and potentially reduce metal concentrations in surface waters." Without a lack of site-specific data for this treatment scenario in the Project location, this finding is an assumption.



Please contact the undersigned if you have any questions or require further information for your review.

Yours truly,

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