MEMO

May, 2022
Telkwa Tenas Coal Mine, Canada

FROM: Dr Gilles Wendling, P.Eng.

TO: **What Matters in Our Valley**

DATE: May 28, 2022

SUBJECT: **PROPOSED TELKWA TENAS COAL MINE, BC, CANADA**

This is a memo completed on behalf of Environmental Law Alliance Worldwide (ELAW) for What Matters in Our Valley outlining comments and concerns of part of the BC EAO EAC Application – Tenas Project, for the proposed coal mine near Telkwa, BC, Canada.

Text *in italics* is text from the reviewed report.

1 COMMENTS

1.1 Project Specific Comments – (Related to water)

1.1.1 General

A coal mine is proposed. Should it be approved, a large pit will be mined, and coal, rock waste, and tailings will be generated. The subsurface is going to be permanently modified, as well as both the surface water and groundwater regimes. Water quality will be modified, and this will affect aquatic ecosystems, wildlife, the local community, and the chain of life in general for decades if not permanently. Although control and mitigative measures are proposed, there is no mine in the world which has not and will not negatively affect water quality. The modifications can take decades to be observed.

Cumulative effects will be triggered. Presently our knowledge and the available tools to estimate cumulative effects are very limited. These will be compounded with the effects of climate change that we are still in the process of apprehending.

It is understood that there are proposed benefits such as employment and economic input. However, they must be compared to the negative impacts to water and watersheds for generations to come. How the landscape and the innumerable processes and functions it provides to sustain life will be negatively affected is extremely difficult to thoroughly assess, qualify and quantify. There is no monetary value that can be allocated to these. They are priceless.

1.1.2 Key Weaknesses

Cumulative Effects:

- "*Baseline conditions represent past and present projects and activities, including existing disturbance*." Therefore, the proponent does not consider cumulative effects from non-disturbed original "virgin" conditions. This is a critical limitation that underestimates cumulative effects.
- Climate change has not been considered in the assessment of cumulative effects. This is a major shortcoming.
- The cumulative effects have been assessed considering the RSA which consists of the Telkwa River watershed. What about the cumulative effects on the Bulley River and on the Skeena River watersheds?
- There are many unknowns on the activity that may take place and listed in Section 4, Chapter 4, Table 6.1.1., which lists the Projects Included in the Assessment for the Groundwater Valued Component (VC) Based on Spatial and Temporal Interaction. Therefore, the assessment of the cumulative effects is very limited and still includes many unknowns.
- "*It is assumed that the current and future projects and activities have appropriate environmental protection measures in place as required by laws and regulations to limit their potential effects within acceptable levels. However, if required, there are several further mitigations that could be incorporated sequentially into the Project dependent on actual monitoring values reflecting mitigations as they are included and still indicating that parameters will exceed SPO's in the Post-closure Phase".*
    a. The proponent clearly indicates that the protection measures are adequate AS REQUIRED BY LAWS AND REGULATIONS (Capital for emphasis), and it does not exclude that the long-term monitoring may reveal worsening conditions that may require additional mitigation measures. Therefore, it still leaves a lot of unknowns.
    b. Our present laws and regulations on cumulative effects are embryonic.
- ALL THE ADDITIONAL MITIGATION MEASURES proposed in Section 6.2 must be implemented. Why should they not be implemented as they are known to reduce the negative impacts the mining operations and infrastructure will have on water.
- "*Due to limited information on location and quantified effects on water quality and quantity of other projects and activities, particularly those in the reasonably foreseeable future, cumulative effects were evaluated qualitatively*." .... AND NOT QUANTITATIVELY. Again, this clearly indicates the limitations of the proponent on its capacity to thoroughly characterize cumulative effects.
- Table 6.3-1 is subjective. The rating of the reversibility and significance are questionable. Note that this table is very coarse, and the level of confidence is moderate. Therefore, the real potential cumulative effects are still very poorly known.
- Regarding cumulative effects on water quality, the proponent states:

a. "*The Reversibility of the effect is expected to be Partially Reversible since the effect is not expected to continue beyond the Year 2100*." It is understood that the state of the environment and the impacts of climate change on the environment are going to be critical in the next decades. Therefore, stating that the effect could be considered partially reversible is wrong.
b. "*The Context of the effect is expected to be Moderate, considering that these activities have been ongoing in the past and the streams have high resilience to small-scale changes in land use and parameter concentrations.*". This comment about the high resilience of the stream is not supported by data.
c. *"The Likelihood of an effect is Unlikely since modeling does not account for attenuation of loads through groundwater pathways."* Modelling relies on many assumptions and the historical knowledge gained from past mining operations would counter this opinion on likelihood.

- The summary on cumulative effects to surface water quality subcomponent presented in Section 4, Chapter 3, Table 6.3.2 underestimates the risks. The observed and long-term impacts resulting from coal mining in the Elk River[1] in BC (for selenium in particular) should be considered as an example on how watersheds can be negatively impacted due to this type of mining, even in jurisdictions under the same regulatory framework.
- The summary on cumulative effects on surface water subcomponent presented in Section 4, Chapter 3, Table 6.4.1 that states the significance is not significant is very subjective and questionable. An adaptive management strategy is proposed to address problems that may arise in the future. The Trigger Action Response Plan will propose mitigative measures. This plan has not been produced yet. However, there is a significant risk that negative effects may take years or decades to develop. There is a high level of unknowns about the parties that will be involved in that time and the capacity to respond technically, financially, and from an organizational perspective. This may take years or decades to unfold. Meanwhile, the environment and local communities will suffer the consequences.

Groundwater (Chapter 4)

- The documents present only two scenarios (base case and high case). More scenarios must be presented describing a broader case of assumptions. Only one rate of groundwater recharge has been used. However, the modification of the land will modify the recharge rate. This has been omitted. Therefore, the cases presented are very limited and do not provide a wide and conservative enough picture of the modification of the water regime.

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[1] Teck has so far invested more than $1.2 billion in water treatment and other measures to contain the pollution flowing from its mining operations, with plans to ramp up treatment capacity later this year. But water quality data shows concentrations of selenium, an element known to cause deformities and impede reproduction in fish and other wildlife, have increased steadily in the Elk River. It now far exceeds the levels the B.C. government recommends for the protection of aquatic life. (The Narwhal, May 26, 2022 https://thenarwhal.ca/teck-coal-mining-ijc-ktunaxa/).

- The results of the hydrogeological model were used to simulate and predict the change in water chemistry. As the only two modelled cases provide very limited scenarios, the assumed modification of the water quality are therefore very limited, too. The presented high case scenario very likely does not present the worst case scenario that can be expected.
- Time steps should consider the times when key infrastructure elements (ponds) are going to be built. The placement of the impermeable surfaces is going to be a critical task. Adverse subsurface conditions may or will be encountered, including artesian conditions. Detailed plans describing the preparation of the sites and the sequence of construction and installation of the key features (liners, embankments, monitoring system, etc.) must be provided.
- "*The maximum reductions of baseflows are predicted to occur prior to construction of the waste and water management facilities. A reduction of about 7% at Tenas Creek, 14% at Four Creek, 3% at the Goathorn Creek, and less than 1% at the Telkwa River is expected*".
    a. The reductions of baseflow must be compared to what would be detrimental to the Environmental Flow Needs.
    b. Considering the effect of climate change is critical and should be clearly accounted and reported. What if this negative impact on baseflow coincides with a drought period and forest fires? What would be the impact on low flows, water temperature, and the aquatic ecosystems the fish depend on?
- In one bullet the document (App04.4-A) states: "*The base case forecasts of potential contributions of mine affected groundwater to baseflows, after 25 years of operations, were 0.3% for Tenas Creek, 0.1% for Goathorn Creek, and less than 0.1% for the Telkwa River. The high case forecasts are 10% for Tenas Creek, 4.3% for Goathorn Creek, and 0.5% for the Telkwa River*". And 7 bullets later it states: "*The predicted long-term contributions of mine affected groundwater to baseflows were 7.7% for Tenas Creek, 3.4% for Goathorn Creek, and less than 0.6% for the Telkwa River for the base case. The high case estimates were 15% for Tenas Creek, 6.5% for Goathorn Creek, and 1.3% for the Telkwa River.*"
    a. This is confusing. What are the right values? For the high case estimates, the potential negative effects are far from negligeable. Again, we need to reflect on the long-term effects and the fact that the water regime will be modified for both quality and quantity over decades.
    b. The level of confidence of the model is moderate. Therefore, the high case scenario may still underestimate the true negative effects.
    c. Under the high case scenario, 15% of mine affected water will contribute to the baseflow of Tenas Creek. We understand that proposed concentrations of selenium and nitrate would be 250 times the background/natural concentrations for discharge water. This means, under the estimated dilution factor of approximately 6, very high concentrations of selenium and nitrate would be present in Tenas Creek. What would be the effect on aquatic ecosystems and water users downstream? The very serious impacts on the Elk river resulting from the Teck coal mines operating in southeast BC, for selenium in particular, should not be repeated on the Tenas, Telkwa, Bukley, and Skeena rivers.

   d. What would be effect over very long-terms (50, 100, 200 years)?

- The model uses equations applying to granular material and assumes the groundwater flow through the fractured bedrock is similar to flow through granular permeable medium. However, flow through fractured medium is not homogeneous but concentrated in the network of fractures. Therefore, using a model adapted to flow in fractured medium would be more adequate and representative. The existing model provides an estimate of the groundwater regime, and how it could be modified by the proposed activities. But again, it is just a model with assumptions and limitations. Reality will be different.

- Seepage is expected under the lined ponds (Figure 1). As the seepage will originate from PAG containing ponds, what will be the risk of poor-quality seepage affecting the quality of the groundwater discharging to the receiving streams (Four Creek and Tenas Creek in particular)? It is anticipated that the sealing capacity of the ponds will deteriorate over time, thus generating more seepage. What is the anticipated long-term effect of this process on water quality? It is understood that the ponds will be there permanently, so what can be expected 100 years or 200 years in terms of degradation of the water quality? Should the modeling underestimate the worsening of the groundwater quality, what would be the long-term solutions that could be proposed to address this impact to receiving water? What would be the cost of implementation of such solutions? Has it been considered in security bonds? Which organization would be responsible for such long-term (decades, centuries?) intervention and mitigations? What are the guaranties that Telkwa Coal Ltd.'s directors would still be involved and liable?

- The documents describe the expected effect on the deterioration of the water quality. For example: "*Discharging facilities (Rail Infrastructure Sedimentation Pond, Tenas Control Pond and North Management Pond) are expected to meet the following calculated end of pipe limits for total selenium (0.050 mg/L) and nitrate-nitrogen (18.8 mg/L) during active discharge periods under Project Case conditions.* "
   a. For selenium, and nitrate-nitrogen, the maximum baseline concentrations for receiving waters are respectively 0.0002 and 0.076 mg/L. This represents a ratio of approximately 250 between the allowed concentration of the discharging effluent and the receiving waters. Why would this not present a negative impact on the aquatic environment over the 20 years of operation?
   b. The results of the hydrogeological model were used to simulate and predict the change in water chemistry. As the only two modelled cases provide very limited scenarios, the assumed modification of the water quality are therefore very limited, too. The presented high case scenario very likely does not present the worst case scenario that can be expected.
- When investigating the impact on drinking water, the proponent has focused on private wells located approximately 3.1 and 3.8 km north and northwest of the proposed mine. The proponent has not addressed the risk associated with surface water and groundwater interactions and how the aquifers and the groundwater users located downstream along the Telkwa River and the Bulk River may be affected by the deterioration of the surface water quality resulting from the mine, mostly considering long and very long-term impacts. This must be done at this stage of the application.

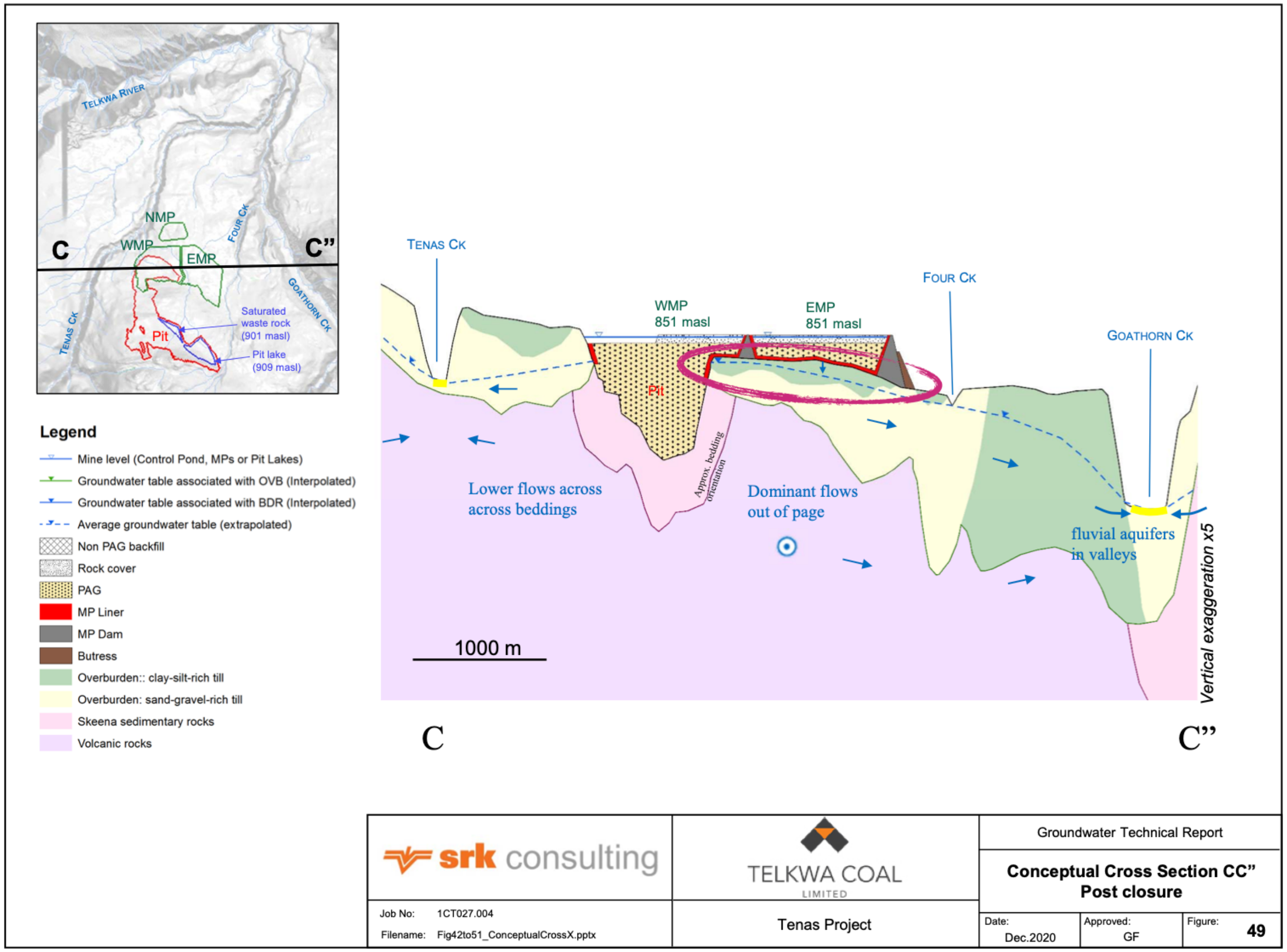

Figure 1: Deterioration of groundwater quality (modified from SRK Figure 49, App01.0-U_Groundwater_Technical_Hydrogeol_Report_Part2)

- Deterioration of the water quality and effect on trust: It has commonly been observed in BC that indigenous communities have lost the trust over water. Although they used to drink the water from streams and eat the fish they fished, as part of their regular diet, the degradation of the water quality resulting from industrial activities has resulted in their loss of trust in the water. They don't drink it anymore and don't eat the fish they fish. Title and rights issues are not addressed in this document. However, it is strongly believed that such a mining project would negatively affect the perception of the local indigenous communities, and the ones living further downstream and would only worsen the fear that water cannot be trusted. This must be addressed at this stage of the application.

Water Demand

- *"Raw water is required for CPP make-up water and for the mine infrastructure complex, i.e., heavy vehicle and explosive facility wash bays, workshop hoses, and non-potable water requirements. Raw water is estimated at approximately 14,000 m3 per month (about 15 m3/h) and will be sourced from precipitation and melting snow collected onsite. Potable water for domestic facilities will be sourced from surface runoff and/or groundwater; a potable water treatment plant will be onsite to ensure that drinking water standards are met. Another 1.5 million m3/year of make-up water is assumed for additional contingency and robustness to the water balance. This water would be sourced from Goathorn Creek (i.e., approx. 2.5% of Goathorn's Creek and less than 1% of the Telkwa River's annual flow respectively) via water supply wells located along the edge of Goathorn Creek."*
    a. For long-term operation of the management Ponds containing PAG material, the ponds always need to maintain the full saturation of the PAG. Should the PAG material be exposed to the atmosphere, then acid generating geochemical reactions will occur. This will have very negative consequences on the mobilisation of heavy metals, the worsening of the groundwater quality, and resulting negative effects on the receiving fish-bearing streams. The water management plan is described in principle. The proponent must provide:
        i. The water balance required to maintain the ponds at an elevation that will guarantee PAG material will remain submerged forever.
        ii. Will this rely only on passive systems? Will pumping be required? How long will pumping be required? For eternity?
        iii. The contingency plan considers that water wells located along the edge of Goathorn Creek will provide the required water.
            1. Are these wells existing? Planned? Will they be able to supply the anticipated yield? What if they don't?
        iv. What will happen in case of recurring summer droughts, over the long-term, in particular considering climate change? Will the PAG remain fully saturated? Will the water supply system considered under contingency be able to operate? Will the creeks and aquifers be able to provide the required water?
        v. Should pumping be required for eternity, what is the very-long term plan proposed for operation and maintenance? How will it be funded? Who will be responsible?

Water Management

- The 1 in 10 year event considered in design both for flood and drought events is not conservative enough, based on the time of construction, operation (end of mining planned at year 21), and closure of the facility, the frequency of extreme events recorded in BC, and the observed and predicted impact of climate change.
- The water management relies on a pumping system to maintain the ponds within optimum operating levels. Extreme events (floods) would typically be accompanied by power failure. What is the contingency plan for power supply in case on extended period of power failure?
- The contingency plan considers that water wells located along the edge of Goathorn Creek will provide the required water. This pumping system is not listed in Table 4-29 (App01-F_Water Management Report). This missing information must be provided.
- In its closure and reclamation section, the water management plan states: "*Toe drainage channels along each dam will remain in-place until monitoring shows that water quality is acceptable for direct discharge to the environment. It is expected that channel C-04 along the toe of the Tenas Control Pond may be decommissioned prior to end of operations after the dam slopes have been sufficiently vegetated to control erosion*"
    a. How long will it take for monitoring to show that water quality is acceptable? What are the long-term plans for collecting and treating these effluents?
- What are the risks associated with buried PAG material to be seasonally desaturated then in contact with groundwater, resulting in a continuous source of contamination of the groundwater? What are the long-term measures proposed to monitor, control, and mitigate that risk over the very long-term? What would be the estimated cost? Has it been included in the security estimate? Would it significantly affect the economic benefit of the proposed mine? The water management risks and mitigation measures proposed in Table 5.1 need to be described with much more details and backed-up by supportive documents.
- "*Climate change considerations for the PMP (Probable Maximum Precipitation) and 1 in 1,000-year event were not considered for this study. Final designs should incorporate climate change into design flood, estimates*"
    a. This is a major limitation. This is not acceptable in light of the extreme events now observed and related to climate change (e.g., atmospheric rivers causing extreme flooding events in BC in November 2021). Climate change must be included at this stage of the design as it has consequences that could directly affect the viability and feasibility of the project.

2 LIMITATIONS

Models were not reviewed in detail. The reviewer has relied on summary information provided in the main body of the report, assuming that they accurately reflected the results of the model.