



Yellowknives Dene First Nation

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August 1, 2019

By email

Mark Cliffe-Phillips
Executive Director
Mackenzie Valley Review Board
Box 938
#200 Scotia Centre, 5102-50th Avenue
Yellowknife, NT X1A 2N7

RE: Depositing Processed Kimberlite in Pits and Underground EA1819-01

Dear Mark Cliffe-Phillips,

The Yellowknives Dene First Nation YKDFN hereby submit our intervention as intervenor to the captioned matter.

We sincerely thank the Mackenzie Valley Review Board its facilitation

A handwritten signature in blue ink that reads "M.A. Thomas".

Machel A. Thomas
Regulatory Research Officer
Yellowknife Dene First Nation
Department of Land and Environment

cc.: Johanne Black (YKDFN Land and Environment) (by email)

August 1, 2019



Yellowknives Dene First Nation

Intervention to the Mackenzie
Valley Environmental Impact
Review Board on Diavik Diamond
mine Processed Kimberlite in Pit
and Underground Environmental
Assessment- EA1819-01

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Who We are and Mandate

The Yellowknives Dene First Nation (YKDFN) has approximately 1500 members who primarily reside in the communities of Ndilo, Dettah and Yellowknife, Northwest Territories.

The Yellowknives Dene First Nation are descendants of Tetsót'iné ("copper or metal people"), the indigenous Chipewyan-related people living around Great Slave Lake and referred to in exploration and fur trade records as Copper Indians, Yellow-knife Indians, Red-Knife Indians, Couteaux Jaunes, etc. These names all refer to the copper tools they were using when first encountered by Europeans.

Some members of the Łutsel K'e Dene First Nation of Łútsëlk'é, and the Deninu K'ue First Nation of Fort Resolution, are also descendant from the Tetsót'iné. The common ancestry of these three First Nations is the reason we joined together, under the name Akaitcho Dene First Nation (ADFN), to negotiate a land claim with the Federal and Territorial Government. For the Yellowknives, the continual documentation of the occupation and use of a huge traditional exploitive range around Great Slave Lake is a significant part of YKDFN's participation in the Akaitcho Process. Beginning in the late 1960s Elder's interviews, backed by exhaustive research in historic records, have revealed a history that definitively links the people who occupied these lands over millennia with their descendants with us, the Yellowknives Dene. We once lived in more than thirty distinct villages along the north shore of Great Slave Lake. These stretched from close to Old Fort Rae in the North Arm to well into the East Arm. The locations of many of these villages are still known and still used seasonally by the descendants of the people who lived there. The rich year-round resources of north shore bays, and the use of steel tools brought by the fur traders, made it possible for us to build permanent structures in the style of those built at Old Fort Providence in 1789. According to our Elders it wasn't long after Old Fort Providence was built that we began to build homes from logs. These homes had stone chimneys that can still be seen today, including those built within the proposed Dinàgà Wek'èhodì Protected Area. We are the Yellowknives Dene whose occupation and use of this entire area dates back many generations, to a time long before the Tłıchq came and settled to this area.

In the 1950s Federal Government policy forced us to move from our north shore villages into permanent settlements in Yellowknife Bay. To differentiate ourselves from other NWT communities where there are descendants of the Tetsót'iné we began to refer to ourselves as Weledeh Yellowknives Dene.

The Yellowknives Dene are the indigenous people who have always used and occupied the lands and waters around Weledeh-Cheh (Yellowknife River and Bay), north to the Barrenlands. This traditional territory is referred to as the Chief Drygeese Territory in the modern administration. This territory represents the key areas through which the people hunted, fished and trapped for time immemorial.

The Land & Environment Department (L&E) of the YKDFN Band Administration has been established by Chief and Council to act as the primary point of contact for a very wide range of issues that deal with Lands & Environment related matters. All matters of land disposition, resource management, development and rights-based consultation initially move through this office. This office aims to achieve a wide range of goals, including the protection of s.35 rights, assertion of YKDFNs aboriginal title across Chief Drygeese Territory, while also seeking equitable economic benefit from industry activities across our territory. All while striving to preserve the Yellowknives' traditional way of life within the heart of our territory, for which now lies the City of Yellowknife.

As a high capacity office this department serves the whole membership needs, in addition to the more typical matters associated with the environment.

The Land & Environment (L&E) department is responsible for the management of YKDFN land and water interests.

Plain Language Summary of Intervention

The YKDFN are not opposed to the idea of placing the processed FPK/EFPK into the mine workings or underground in theory. YKDFN think in-pit storage has the potential to be a positive outcome for the site as it reduces the long-term environmental impact from storing it in a PKC facility and from dam raises and storage of processed kimberlite at higher elevations in the landscape where it is subject to erosion and distribution in the environment. However, there is too much uncertainty surrounding the modelling of water quality scenarios.

The deposition PK to mine workings is an irreversible undertaking in that, once the slurry is placed the possibility to remove it from the pit is low to unlikely, as such it should be ensured that thresholds, and levels of significance are properly scrutinized and defined with the input of indigenous perspectives. Additionally, YKDFN need to be assured that prediction models are well informed and as accurate and as reliable as possible before EFPK is placed into any of the pits. These are particularly significant to the YKDFN cultural use as it the base that informs assessment of potential effects on cultural use. (DDMI, 2019, p. 145)

Overall, infilling the pits seems to be the best environmental solution when compared to the semi dry storage currently used. Not breaching the dykes and leaving the potentially contaminated water contained unless there is hydrological reason for doing so that I am not aware of, such as they will overflow anyway, may be a better long-term solution. The assessment states that the exclusion of fish from the pit lakes would have a negligible effect on fish production in Lake de Gras and that DDMI would work with Aboriginal groups to create new habitat as fulfillment of the “no net loss” plan approved by DFO in 1999. This would seem a less risky approach.

YKDFN also believes that monitoring and closure plans should be adjusted to be in alignment with the outcome of these proceedings prior to the commencement of the project. Further we are also of the view and recommend that MVEIRB stress the development of key performance indicators through the lifetime of the project and as a collaborative initiative between developer and indigenous community.

Water Quality Modelling

Developer's Position

Documented Assumptions

Documented assumption 1:

“The model did not incorporate groundwater inflow, which allowed assessment of effects of PK consolidation and porewater chemistry separately from groundwater. This assumption was thought to be reasonable as the total groundwater inflow using a rapid fill scenario is small based on the work conducted in 2010 for A154 (DDMI 2019).”

- (DDMI, 2019, p. 52)

Discussion

It is unclear, where groundwater would enter the flooded pit: i.e. above the porewater blanket, within the depth occupied by the porewater blanket, or within the FPK deposit itself. Particularly for the second and third of these, it is unclear whether groundwater contributions to pit lake volumes, stratification, and transport dynamics in the post closure period, over a time horizon of years to decades would influence permanent stratification and water quality in the upper-most water column. The groundwater contributions over longer time periods have the potential to (i) increase the volume of the lower water mass, and (ii) provide a forcing mechanism for advective exchange with surface waters.

It is noted that hydraulic gradients between the lake ecosystem and recharge areas adjacent to the flooded pits and lake are generally low, and the annual groundwater flux is also likely to be low. We assume that this information is known by the proponent, however, and should be more explicitly discussed.

Documented Assumption 2:

“A change in the size of the areas where the dike is breached was not predicted to affect the surface water quality in the pit lake (Golder 2019a). However, the modelling indicated that a water cap of approximately 50 m depth was necessary to isolate the PK porewater from the surface and facilitate the stratification (stable meromixis) and was an effective mitigation for water quality based on the low surface water concentrations (Golder 2018). By extension, deeper water caps would be similarly or more effective at sequestering the more highly concentrated waters in the bottom of the pit lakes.”

- (DDMI, 2019, p. 53)

Establishment of a strong pycnocline does not curtail diffusive flux, and the magnitude of upward diffusive flux between an upper and lower water body is likely to be no less than the magnitude of diffusive flux if lake water were to lie immediately over top of deposited FPK with its internal porewater content, except to the extent that the concentration gradient across the sediment-water interface is likely to be higher than for a porewater blanket and it is the solute concentration gradient that is the primary determinant of flux rate.

If the upper surface of the porewater blanket is in equilibrium with the porewater contained in the FPK (or EFPK) deposit, it should be assumed that the substance concentrations within the lower trapped water mass will be uniform laterally and vertically - unless there is some other mechanism for development of a vertical gradient (e.g. chemical precipitation and settling through the lower zone).

Assuming a lower water mass with substance concentrations reflecting equilibrium partitioning with the underlying FPK deposit, the concentration gradient across the pycnocline separating the porewater blanket and the overlying water from Lac du Gras must be the same as the gradient that would occur if the lake water were immediately adjacent to the FPK deposit. By extension, rates of diffusive flux must be the same.

Overall, the interpretations arising from the “two dimensional, laterally averaged, hydrodynamic and water quality model (**CE-QUAL-W2**)” used to support the water quality predictions and aquatic ecological effects assessment, and the discussion of meromixis in general, would have benefited from a better conceptualization of the important lake processes., as we discuss below.

The methods are summarized in the SIS as follows:

“The model predicted changes in total dissolved solids, temperature, and two generic surrogate parameters: (1) a conservative water quality constituent that could be used to predict the concentrations of specific parameters (i.e., major ions, nutrients, and metals); and (2) a settleable constituent to predict the behavior of particulate materials. The model included meteorological and hydrological data, water quality data from Lac de Gras, and chemistry data for the PK porewater and extra fine PK (EFPK).”

The transport of a substance dissolved in water, either between the lakebed porewater and the bottom water, or between water layers will reflect two processes:

- i (i) **Diffusive flux** – the movement of a solute from an area of higher to lower concentration;
- and

ii (ii) **Advective transport** – the movement of a solute based on mass transport of the water mass in which it is contained, typically in association with the associated mixing with adjacent water masses.

Diffusive flux is a very slow transport process and is well described by **Fick's First Law of Diffusion** for both upward diffusion of substances from the lakebed into the overlying water column and across the pycnocline in seasonally or permanently stratified water bodies. We refer here first and foremost to the pycnocline, which reflects a large decrease in water density with small vertical distance between a lower and upper water mass. Differences in densities of water masses, in turn, generally reflect differences in water temperature, or rarely in freshwater systems with very high TDS differences in salinity (or chlorinity). The term for the boundary between distinct water bodies as used in the SIS is "chemocline": however, it is not the chemical concentrations of substances of potential concern *per se* that establish the conditions for water column stratification but rather density, which is not discussed in the SIS.

Advective transport occurs very rapidly providing the drivers exist for it to occur (e.g. density driven transport, wind generated waves and currents).

YKDFN Position

YKDFN is of the opinion that water quality is most significant Valued Component (VC) as it has major influence and/or impact on all the other identified VC's. It is therefore paramount to ensure that water quality is as close as possible to the water quality at genesis of mine. The modelling can only be deemed as a priori analysis. Additionally, YKD

A legacy of water contamination from previous mining operations in the Chief Drygeese Territory has led many Elders to express profound mistrust regarding the intention of the mines to prevent water contamination. Water contamination where the people currently live has heightened sensitivity to water quality issues around mines and their potential for environmental harm.

In the 1990s, the Elders stated that people had observed negative alterations to the environment but without positive recognition of contamination by scientific experts they lacked 'proof' to prevent further harm:

The development of the Giant mine before there were environmental regulations resulted in air-borne arsenic dissolving in the water and settling in sediment of nearby lakes, bays, and rivers, including the Weledeh. Further air-borne arsenic entered these water bodies through runoff of melting snow and ice. To this day, sediment and riverbanks of the Weledeh contain large amounts of arsenic (Yellowknives Dene, 1997, p. 22).

Before Weledeh Yellowknives Dene understood what arsenic was, they were aware of changes that made them wary of the water, fish, berries, and plants near the mine sites...The people were never warned about the impacts and risks of living near mines...To this day they refuse to use water from the Weleh-Cheh for soaking caribou hides or making dryfish (Yellowknives Dene, 1997, pp. 22-23)

“As a result of the mines in this area, the land has been wasted, destroyed and contaminated; mining has occurred for more than 50 years and a lot of damage has been incurred; the water is contaminated, the fish are contaminated, all the traditional food and medicinal plants have become contaminated; rabbits and grouse are contaminated; the Dene people have become very cautious of eating traditional foods because of the heavy contaminants in the water, land, and air; the contamination even destroys trees, marshes, habitat, and wild berries; all the things that the Dene people want to use but cannot use anymore; the Weledeh cannot use the water or eat any of their traditional foods; the mining companies should compensate the people around the area that has been contaminated for destroying their water, fish, land, and wildlife; the Weledeh don’t fish in the bay here anymore, they have to go to Wool Bay, they have to go to communities far from the mines to get their fish and waterfowl.” (Isadore Sangris Interview, Aug. 11, 1997).

Recommendations

The water modeling predictions need to be optimized as incorrect prediction can have catastrophic adverse effects on the environment and all other VCs. To ensure this, YKDFN recommend the modeling is streamlined, with better informed, more robust (e.g. suspended particles modeling) and updated data as it may become available and that said modelling be executed throughout the project lifetime prior to and post deposition into mine pit and externally reviewed by hydrological specialists.

Mining companies must involve Weledeh Yellowknives Dene in the monitoring impacts from mining on water quality, water flow, water level, fish, aquatic plants, and wildlife relying on water. (Yellowknives Dene, 1997)

Mining companies and government specialists must continue to verify where water flows from Ek’ati. Monitoring of water flow and levels must be continual throughout and after mining operations.

Mining companies must involve Weledeh Yellowknives Dene in the monitoring water quality, water flow, water level, fish, aquatic plants, and wildlife relying on water.

Exclusion of A21

Developer Position

The developer seeks to have assessed the suitability of three (3) separate mined out kimberlite pits (A418, A21 and A154) for the deposition of processed kimberlite back into their respective mine workings and underground. Assessment of the modelling scenarios for these indicate that for A21 porewater will diffusion more quickly into Lac de Gras than the others pits and that meromixis will breakdown in 50 years as opposed to the 100 years expected for the other pits. A418 and A154.

In response to GNWT IR #17 Diavik states that the inclusion of A21 as part of the current assessment is to be prepared in the event it becomes available for deposition earlier than A418 and A154

Additionally, in response to MVEIRB IR #2 seeking clarification project description DDMI on (July 4, 2019) stated:

“It is also plausible that given the coincidental availability, deposition to a combination of mine workings would produce the lowest net effect on the water quality of Lac de Gras”

Discussion

Only one pit is required for EPK storage for the estimated waste to be produced for the remaining life of mine, coupled with the fact the developer no longer seeks to relocate or mine any PK from the PKC facility. Additionally, water quality modelling indicates that the A418 pit is the best location from a water quality perspective.

Modelling for A21 shows loss of stratification for A21 after approximately 50 years (DDMI, 2019, p. 59) Figure 4-4, Appendix B) because of insufficient water cap, and does not highlight what is a suitable minimum cap to maintain stratification in perpetuity.

It is not apparent how significant adverse effects on water quality for A21 can be mitigated given that the modelling predicts an adverse high magnitude effect of moderate duration within the PDA during closure and post-closure. (DDMI, 2019, p. 75)

Taking this plausibility into consideration, YKDFN is of the opinion that due to having the least favor modelling predictions the board do not consider this lake pit as a as

Recommendation

We are of the opinion that Pit A21 should not be considered by the board as a viable option for PK deposition in any of the developers highlighted Scenarios.

Fish & Aquatic Life

Developer Position

Fish will only be allowed access to the lake once stratification has been achieved and water quality in the top 40 m has been shown to meet benchmarks established in the monitoring program. Fish are not expected to go below 40 m because traditional knowledge indicates that fish are typically found between 6 and 20 m in Lac de Gras. Exclusion of fish from pit lakes at closure is expected to have an insignificant effect on fish populations

YKDFN Position and Discussion

There is a lot of reliance on fish species not going deeper than 40 m because it limits their interaction with potentially low DO, elevated metals and nitrite concentrations at lower depths.

The assessment doesn't explain with sufficient justification why the depth of 40 m has been chosen as the zone in which water quality should be a concern, and further does not explain why stratification of the pit lakes is the answer to potential water quality impacts to fish. For example, lake trout are known to retreat to the colder water of the hypolimnion during warm summer months – this represents the lowest levels of a stratified lake.

What are the contingencies if the pit lakes do not permanently stratify and water quality deteriorates in the upper layers of the pit lakes and out into Lac de Gras after the dikes are breached? This would appear to represent a high risk if permanently lake stratification does not occur as predicted.

Recommendation:

The proponent should be providing hydrologic studies and modeling of potential effects on littoral fish habitat to recommend maximum withdrawal rates that maintain water levels in Lac de Gras and the Coppermine River to prevent ice scour and impacts to fish and fish habitat, along with the estimated time to fill the pit lakes at these withdrawal rates.

Downstream effects in Coppermine River as a result of changes in flow do not seem to be adequately addressed. YKDFN therefore recommend that before the dams are breached that quantitative habitat assessment and sensitivity analysis are executed by the developer.

Government specialists and an independent environmental monitoring agency picked by the Yellowknives Dene and the company should verify environmental information for reports and monitoring of mining effects. Contractors working for mining companies in these areas must have at least ten years of field experience most of it in northern environments, and field staff working for such contractors must have at least two years of experience collecting field data. Contract scientists or fisheries and aquatic specialist researchers will hire Yellowknives Dene landowners for fish monitoring and related work. (Yellowknives Dene, 1997)

Reconnection to Lac de Gras

The intention is to connect the deposited and subsequently flooded pit to Lac de Gras once the established criteria is met and it is deemed favorable so to do in accordance with the existing closure plan.

Developer Position

Once criteria are met and indicators are below established thresholds the pit lake will be reconnected to Lac de Gras. The developer's assessment also states fish will only be allowed access to the lake once stratification has been achieved and water quality in the top 40 m has been shown to meet benchmarks established in the monitoring program.

Exclusion of fish from pit (DDMI, 2019, p. 110) would be expected to have a negligible effect on the production of fish populations in Lac de Gras. Additionally, Diavik in response to MVEIRB supplementary IR#1 when asked to clarify isolation scenario, explained that said scenario would refer to the isolation of fish from the lake in the event water quality was reduced and not suitable for aquatic life.

YKDFN position

YKDFN reiterates its opinion that water quality is of paramount importance to this undertaking. As it impacts all the other VCs and immensely so. We tend to agree with the developer in terms of habitat value regarding the overall population of fish in Lac de Gras, however, our point of divergence is, that if conditions escalate to a point where fish has to be excluded from a pit lake after dam has been breached we believe this would be detrimental to the water quality in the wider

Lac de Gras. Even in the absence of such poor water quality for fish, the perception dene with certainly be adversely influenced.

Recommendation

YKDFN would tend toward the idea of leaving the lake isolated so that it forms its own self containing lake so long as monitoring procedures and protocol are developed to include indigenous community and the development of contingency plans in the event of a dam structure breach.

And in the event, it is chosen to be reconnect, we would be in favor of the establishment or assessment of traditional or indigenous knowledge as considered criteria rather than the heavy western science orientation which currently seems to be the focus of the EA.

Closure Objectives and Monitoring

YKDFN Position

With the potential change of mine plans to store PK into the working mines and underground, the closure objectives will undoubtedly have to be developed to align with proceeding outcome decision. Additionally, the closure plan is a primary instrument in effectively monitoring and mitigating the long-term effects of the mining activity.

Recommendation

YKDFN recommended that in the event of a positive decision in favor of going ahead with the deposition, that closure objectives be collaboratively developed among the indigenous groups and the developer. Notwithstanding the existence and of the current Diavik TK panel, we believe the extent of the collaborative effort should go beyond those confines and developing key performance indicators with the location indigenous community.

It is also important for the developer to ensure that youth are engaged in the monitoring of all stages of the mine, as they will be the monitors in times to come and will undoubtedly pass the baton onto other generations, this is essential for monitoring the long term effects of the mine activities.

Bibliography

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