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MEMO

From	Merle Keefe
To	Richard Dwyer
Ref.	2AM-BRP1831
Date	12 April 2024
Subject	Llama and Umwelt Dewatering Plan – Responses to Review Comments

Dear Mr. Dwyer,

Thank you for the opportunity to respond to comments received on the Back River Project (Project) Llama and Umwelt Dewatering Plan submitted under Water Licence 2AM-BRP1831 (the Licence). Comments were received from the Kitikmeot Inuit Association (KIA), Environment and Climate Change Canada (ECCC), Fisheries and Oceans Canada (DFO), and Crown Indigenous Relations and Northern Affairs Canada (CIRNAC).

B2Gold Back River Corp. (B2Gold Nunavut) thanks all parties for their review of our submission and provides responses below.

Sincerely,

Merle Keefe
Manager, Environment
B2Gold Nunavut

Cc: Kristina Benoit, Manager, Environmental Permitting, B2Gold Nunavut

Interested Party:	**Kitikmeot Inuit Association (KIA)**	**TRC NO.:**	**KIA-NWB-01**
Re:	**Discharge Point**		

KIA's Comment:

Will the treated water in Stage 2 be discharged at the point on the map labeled "Treatment Effluent Water Discharge" whereby it will be expected to flow northwest to the fish barrier before flowing east along the established flow path from Umwelt to Goose Lake?

B2Gold Nunavut Response:

The 'Treated Effluent Water Discharge' location indicated on the map is the discharge to land from the Goose Mine Camp Sewage Treatment Plant and is unrelated to dewatering activities.

The discharge point of the water being discharged during dewatering will be directly to the natural drainages (i.e. stream channels) flowing from Llama Lake to Umwelt Lake and from Umwelt Lake to Goose Lake. The exact locations have not been indicated on the map as they will be selected in the field as those identified to be most accessible as well as resistant to erosion, least likely to result in suspended sediments, and most able to further disperse discharge flows prior to entry of this water into Goose Lake.

Interested Party:	**Kitikmeot Inuit Association (KIA)**	**TRC No.:**	**KIA-NWB-02**
Re:	**Water Treatment Plant**		

KIA's Comment:

If so, how will water be pumped from Umwelt to the water treatment plant for discharge? There is no infrastructure indicated on the map to facilitate this transfer of water.

B2Gold Nunavut Response:

Should water treatment be needed, a mobile water treatment plant will be positioned near to Umwelt Lake, likely near existing roadways or within the footprint of what will become the saline water pond. Water will be piped to this plant from Umwelt (and/or possibly Llama) Lake, and treated water will then be pumped via a pipeline to the selected discharge point along the natural drainage pathway between Umwelt and Goose lakes.

Interested Party:	**Kitikmeot Inuit Association (KIA)**	**TRC No.:**	**KIA-NWB-03**
Re:	**Water Treatment Plant**		

KIA's Comment:

If not, will B2Gold Nunavut confirm that a temporary treatment plant will be commissioned at Umwelt for discharge along the established flow path to Goose Lake if the Stage 3 alternative is not used?

B2Gold Nunavut Response:

B2Gold Nunavut confirms that, should a temporary treatment plant be utilized, it will be commissioned near Umwelt Lake for use prior to discharge.

Interested Party:	**Kitikmeot Inuit Association (KIA)**	**TRC No.:**	**KIA-NWB-04**
Re:	**Water Withdrawal and Pipe Screens**		

KIA's Comment:

Given that the quantity of water being discharged downstream over a 5-to-10-week period is 1,370,000 m3 at a rate of 10% of peak flows from Goose Lake, will fish and fish habitat monitoring take place in the downstream receiving environment and discharge rates reduced if any negative effects are observed? Discharge rates are tied to peak freshet flows and these flows will be elevated by 10% which may result in negative influence such as increased scouring and sedimentation which may impact any spring spawners in the system such as Arctic Grayling.

B2Gold Nunavut Response:

There are no spring spawners in the upstream watercourse that will direct discharged water to Goose Lake. This watercourse was identified as non-fish bearing during baseline investigations. Although Goose Lake may not provide spawning habitat for spring spawning fish such as Arctic Grayling, B2Gold Nunavut will monitor the receiving lake environment. B2Gold Nunavut will undertake daily turbidity and erosion monitoring at the point of discharge as well as at the point of entry into Goose Lake to ensure discharge is not causing harmful scouring or sedimentation in the vicinity of the point of entry. Residual effects to downstream habitats, including the Goose Lake outlet, are not anticipated during the discharge period. B2Gold notes that a rate of 10% of peak flows was selected to ensure discharge was within the natural bounds of flow rates these drainages would be subject to each year during freshet.

B2Gold also notes that the Goose Lake Outflow discharge rate quoted in the Dewatering Plan was incorrect and has now been corrected, along with associated dewatering discharge rates. See response to CIRNAC-2 and the Updated Dewatering Plan.

Interested Party:	**Environment and Climate Change Canada (ECCC)**	**TRC No.:**	**ECCC-NWB-01**
Re:	**Stage 3 Water Management**		

ECCC's Comment:

ECCC recommends that the Proponent Clarify the water management at Stage 3 of dewatering, including the potential to store water in Umwelt and Llama Lakes

B2Gold Nunavut Response:

As noted by ECCC, the intent of dewatering of Llama Lake is to allow development of Llama Pit, while dewatering of Umwelt is being undertaken to create capacity for the storage of saline water. It has been identified by B2Gold Nunavut that, at some point during dewatering, the raw water being discharged will no longer meet TSS discharge criteria. At that time, B2Gold Nunavut will either initiate water treatment to remove TSS (Stage 2) or will place any non-compliant water in the Primary Water Pond for use during mill start-up (Stage 3). However, the Primary Pond may not have sufficient capacity to contain all remaining non-compliant water from Llama and Umwelt Lakes. As a result, if water treatment is not undertaken, or is unable to efficiently treat the residual raw water, water may also be left in Umwelt Lake (the future Saline Water Pond). This water may be used in future for Process water start up, or may remain in the Saline Water Pond, adding to the saline water to be managed within this facility.

Interested Party:	**Environment and Climate Change Canada (ECCC)**	**TRC No.:**	**ECCC-NWB-02**
Re:	**Triggers for transition from Stage 2 to Stage 3**		

ECCC's Comment:

Discuss triggers that will guide the decision making to transition from Stage 2 to Stage 3.

B2Gold Nunavut Response to ECCC-2:

Once Llama and/or Umwelt water quality does not meet discharge criteria, the decision of whether to continue discharge with treatment (Stage 2), or to contain and manage the non-compliant water (Stage 3), will be made based on a combination of operational considerations, including: anticipated start up water needs, available water storage capacity, project development timing (i.e. timing of process plant start-up as well as initiation of use of Saline Water Pond), process plant operating constraints (the ability of the Process Plant to use slightly saline water) and the costs and capabilities of a water treatment plant. At this time, B2Gold Nunavut is not anticipating that water treatment will be operationally necessary, but rather intends to discontinue discharge once discharge criteria are met and store this water in the Primary Pond or Umwelt Lake (Stage 3). Residual water in Umwelt Lake may be used in future by the Process Plant or for dust suppression, or dewatering may be resumed at a later date (i.e. during the 2025 open water season), with or without treatment depending on water quality.

This information has been included in the Updated Dewatering Plan to reflect these possibilities.

Interested Party:	**Fisheries and Oceans Canada (DFO)**	**TRC No.:**	**DFO-NWB-01**
Re:	**Dewatering Sequence**		

DFO's Comment:

The dewatering plan discusses the schedule for the project (Section 3.0 Schedule, Pg. 2) and outlined that Llama Lake would take ~5-10 weeks and Umwelt would take ~6-10 weeks.

DFO requests to the proponent to confirm whether both lakes will be dewatered during the same time frame or separately

B2Gold Nunavut Response:

Dewatering of both lakes is intended to occur simultaneously over the dewatering period, with Llama Lake being dewatered into Umwelt Lake (via Llama Outflow) at the same time that Umwelt is being dewatered into Goose (via the natural discharge pathway to Goose). However, should one of the lakes develop water quality which is not compliant with discharge criteria, or approach criteria thresholds, the other Lake may continue to be dewatered individually to Goose Lake, via discharge to the natural drainages between Umwelt Lake and Goose Lake.

B2 Gold also notes that, if dewatering is not completed by the end of 2024, it may be resumed in 2025. This has been noted and clarified in the Updated Dewatering Plan submitted with these responses.

Interested Party:	**Fisheries and Oceans Canada (DFO)**	**TRC No.:**	**DFO-NWB-02 and 3**
Re:	**Water Withdrawal and Pipe Screens**		

DFO's Comments:

In section 4.0: Pumping Methods and Pipeline, Intake, and Outflow Structure Design. Pg.2 discusses the use of fish screens on the water intake pumps for dewatering the system.

DFO confirms that the water intake pipes should be equipped with fish screens to prevent the

Possible entrainment or impingement of fish to adhere to the Freshwater Intake End-of-Pipe Fish Screen Guideline (DFO ,1995) for all water intake within waterbodies that support fish.

B2Gold Nunavut Response:

B2Gold Nunavut appreciates this guidance and will ensure that uptake lines will be equipped with fish screens to prevent the possible entrainment or impingement of fish in adherence with the Freshwater Intake End-of-Pipe Fish Screen Guideline (DFO, 1995) in waterbodies which support fish. However, there will be no risks of fish impingement or entrainment during the dewatering period. All fish in Llama Lake and Umwelt Lake were removed during late summer 2023 during the fish-out program (i.e., DFO fish depletion criteria were satisfied) and recolonization of those lakes by fish will not occur because nearby source populations have also been removed as part of the fish-out program.

Interested Party:	**Fisheries and Oceans Canada (DFO)**	**TRC No.:**	**DFO-NWB-04**
Re:	**Discharge Location**		

DFO's Comment:

In section 5.0: Maximum Pump Rates Pg. 3. The dewatering plan discusses that the dewatering discharge will be directed to the outflows of Llama and Umwelt Lake and then to the Goose Lake. DFO requests to the proponent to confirm that the Goose Lake Discharge area is at the Goose Lake inflow (east/south).

B2Gold Nunavut Response:

In Figure 3 of the Dewatering Plan, the point of entry (discharge) into Goose Lake of this dewatering water is the at the extreme western extent of Goose Lake. The entry of this water will be via the natural drainage depicted on the map, which includes all water from Llama and Umwelt lakes as well as other drainages which combine prior to entry into Goose Lake. The blue dashed lines on Figure 3 running along the Llama Lake Outflow and the Umwelt Lake Outflow indicate the approximate dewatering pathway, with water continuing on to Goose Lake form the point of discharge.

Natural Goose Lake Discharge is calculated as the discharge from Goose Lake itself, at the Goose Lake Outflow located at the eastern extent of Goose Lake.

Please see response to CIRNAC-2 and the Updated Dewatering Plan for an update on Goose Lake and dewatering discharge rates.

Interested Party:	**Fisheries and Oceans Canada (DFO)**	**TRC No.:**	**DFO-NWB-05**
Re:	**Pump Rate**		

DFO's Comment:

In section 5.0: Maximum Pump Rates Pg. 3. The document outlines the targeted pump rate of 963m^3/hr (10% of 231,000m3/day)- actual expected is between 750-963m^3/hr and includes erosion prevention measures and inspection procedures.

DFO acknowledges that the proponent needs to minimize the natural re-filling of the system and the pump rate must be able to dewater effectively. The proposed pump rate and erosion prevention should limit scour and bedload movement in the natural downstream channels and flow path to the Goose Lake discharge location. The proponent should be aware that if the pump rate is too high, it could cause a perpetual flooding downstream and need to be adjusted to avoid connecting to other watercourses nearby.

B2Gold Nunavut Response:

B2Gold Nunavut acknowledges DFOs statement that the "*proposed pump rate and erosion prevention should limit scour and bedload movement in the natural downstream channels and flow path to the Goose Lake discharge location*". B2Gold Nunavut also recognizes that flooding may become an issue if pump rates are too high. However, proposed rates have been set to minimize risks to the downstream environment and will be actively managed, when required, based on monitoring of water levels and flow paths during the discharge period. If there is significant bedload movement within the receiving upstream watercourse or flooding outside of the normal high water mark of the receiving upstream watercourse, B2Gold Nunavut will notify DFO within 24 hours of an observation of concern to discussion mitigation options. Potential mitigation may include reducing pump rates or potentially relocating the discharge point to a location downstream of the area of observed flood risk. B2Gold has also included the contingency of continuing dewatering activities in 2025 in the updated Plan, should it be needed. Please also see response to CIRNAC-2 and the Updated Dewatering Plan for an update on Goose Lake and dewatering discharge rates.

Interested Party:	**Fisheries and Oceans Canada (DFO)**	**TRC No.:**	**DFO-NWB-06**
Re:	**Date Error**		

DFO's Comment:

In 2023, the fish-out of the Llama-Umwelt system occurred, if remaining fish are observed during inspections and monitoring in the flow path or in the lakes when dewatering occurs, the proponent is required to notify DFO and to discuss next steps.

B2Gold Nunavut Response:

The likelihood of fish in the flow path of water discharge is extremely low because i) Llama and Umwelt Lake were fished out in late summer 2023, as well as the nearby waterbodies that would otherwise provide source populations for recolonization, and ii) receiving upstream watercourses are non-fish bearing waterbodies based on baseline investigations. However, as required by DFO, B2Gold Nunavut will be conducting a fish survey at the start of the 2024 open water season to verify success of the 2023 fish out of these lakes. Should fish be encountered in Llama or Umwelt Lake, B2Gold is commitment to remove fish to satisfy depletion criteria and to work with DFO for further guidance on next steps.

Interested Party:	Crown Indigenous Relations and Northern Affairs Canada (CIRNAC)	TRC No.:	CIRNAC-NWB-01
Re:	Date Error		

CIRNAC's Comment:

The Licensee is required to monitor effluent discharge from the dewatering of Llama and Umwelt Lakes into Goose Lake. Effluent discharge quality limits are established for total suspended solids (TSS), turbidity, aluminum, and pH, as per Part D, Item 26 of the Type A Water Licence.

In the Llama and Umwelt Lake Dewatering Plan, the Licensee indicated that TSS concentrations will be used to guide water treatment and dewatering activities to Goose Lake. In Section 6.2, the Licensee described measures that would be taken if TSS concentrations approach or exceed discharge quality limits, but other parameters, such as pH, are not discussed.

CIRNAC notes that using TSS as the only indicator for water treatment and dewatering activities may not be sufficient for ensuring compliance with water quality discharge limits to Goose Lake (station BRP-01). For instance, TSS concentrations in Llama Lake outflows in 2018 were reported as <3.0 mg/L, but field-measured pH were less than 6.0 on June 11, July 14, and August 11 (Aquatic Baseline Synthesis Report, Appendix 2C – 2018 Raw Water Quality Data – Lakes and Streams, pg. 1219/1676). These field measurements demonstrate that TSS concentrations can be less than the effluent quality limits (15 mg/L maximum average or 30 mg/L maximum in a grab sample), while pH can be below the acceptable limit (i.e., between 6.0 and 9.5).

CIRNAC recommends that the Licensee update the Llama and Umwelt Lake Dewatering Plan to reflect how it will respond if water sampling indicates other parameters, such as pH, exceed water quality discharge limits to Goose Lake, as outlined in the Type A Water Licence.

B2Gold Nunavut Response to CIRNAC-1:

B2Gold Nunavut has updated the Dewatering Plan to reflect responses to exceedances of parameters other than TSS. B2Gold Nunavut appreciates CIRNAC's careful review of the baseline data. The cited pH values were for Llama Watershed Outflow (although named Llama Outflow in that report) and represent a sampling location immediately prior to entry of the western watersheds into Goose Lake (see Figure 1 below). This sampling location represents the combined water quality of a broader drainage area, which includes Llama and Umwelt lakes, but which is not directly reflective of either Llama or Umwelt water quality. B2Gold Nunavut has checked the available baseline data for Llama and Umwelt lakes, as well as their direct outflows, and can confirm that there is no indication of concern related to the pH of these waterbodies. However, in the updates to the Dewatering Plan related to exceedance of a parameter, B2Gold Nunavut has included the possibility of further water treatment (beyond that targeting TSS), such as the correction of pH, to allow for continued discharge if necessary. B2Gold has also included the possibility of resuming dewatering of Umwelt Lake in 2025, if necessary, with or without treatment (as needed, based on water quality).

Interested Party:	**Crown Indigenous Relations and Northern Affairs Canada (CIRNAC)**	**TRC No.:**	**CIRNAC-NWB-02**
Re:	**Date Error**		

CIRNAC's Comment:

The Licensee indicated that it intends to discharge water at a rate no greater than 10% of the average peak freshet discharge rate of Goose Lake, which was reported to be 231,000 m3/day, to ensure pumping impacts on flow are within system tolerances and natural variability. CIRNAC notes that the Licensee did not provide supporting information to validate this statement in the Llama and Umwelt Lake Dewatering Plan.

CIRNAC identified the following passage in the Site Water Monitoring and Management Plan, which was submitted to the Nunavut Impact Review Board (Section 8.1 - Construction Phase, pg. 47/53):

"If released volumes of water change stream base flows or water levels by greater than 10% of baseline, then water transfer rates will be adjusted as required".

However, CIRNAC reviewed other documents listed in Table 1 and did not identify any explicit references to the reported average peak freshet discharge of 231,000 m3/day for Goose Lake.

Applicable management plans and/or analysis should be referenced to support statements in the Llama and Umwelt Lake Dewatering Plan. Without this information, CIRNAC is unable to assess the adequacy and accuracy of the Licensee's statement. CIRNAC recommends that the Licensee reference applicable management plans and/or analysis that supports any statements (e.g., average peak freshet discharge rate for Goose Lake) outlined in the Llama and Umwelt Lake Dewatering Plan.

B2Gold Nunavut Response:

On an evaluation of the Goose Lake peak discharge it has been determined that the value used in the Dewatering Plan was incorrect. Goose Lake Outflow peak daily discharge values for each year of observation for are provided in the table below by year, along with references to the report in which the data was included. These reports were appendices to the Back River Project FEIS and are available on the NIRB public registry. Monitoring was also conducted in 2021, 2022 and 2023, but has not been included in this table, as monitoring in each of those years commenced after peak discharge. However, it is noted that the highest Goose Lake discharge rate observed was in 2022 with a discharge of 435,669 m3/day observed, despite having missed peak freshet discharge.

Monitoring Year	Period of Observations	Max Daily Mean Flow Recorded at PL-H2 (PN03) (m^3/s)	Max Daily Mean Flow Recorded at PL-H2 (PN03) (m^3/day)	Note	Source / Reference
2011	3 Jun to 2 Oct	3.83	330,480	Captured peak	Rescan. 2011. Back River Project: 2011 Hydrology Baseline Report. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd. Ref. No. 0833-002-02.

2012	29 May to 23 Sep	4.22	364,954	Captured peak	Rescan. 2012. Back River Project: 2012 Hydrology Baseline Report. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd. Ref. No. 0833-002-02.
2013	22 May to 19 Oct	3.99	344,390	Captured peak	Rescan. 2013. Back River Project: 2013 Hydrology Baseline Report. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd., an ERM company. Ref. No. 0194096-0002.
2014	22 May to 23 Sep	3.78	326,419	Captured peak	Rescan. 2014. Back River Project: 2014 Hydrology Baseline Report. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd., an ERM company. Ref. No. 0234411-0022.
Average			341,561		

Based on this data, Average Daily Peak Discharge observed at Goose Outflow is 341,561 m3/day, which equates to 14,232 m3/hr.

The information included in this table, as well as and updated discharge rate has been included in the Updated Dewatering Plan. The proposed peak dewatering discharge rate remains at 10% of Average Peak Goose Lake Discharge

Interested Party:	**Crown Indigenous Relations and Northern Affairs Canada (CIRNAC)**	**TRC No.:**	**CIRNAC-NWB-03**
Re:	**Date Error**		

CIRNAC's Comment:

The Licensee indicated that Llama Lake will be dewatered to facilitate the construction of an open pit and mining operations, and Umwelt Lake will be dewatered to facilitate construction of the Saline Water Pond. It is expected that water from Llama Lake and the tributary ponds will likely be discharged to Goose Lake via Umwelt Lake, which is the natural downstream waterbody from Llama Lake and upstream waterbody from Goose Lake.

After reviewing the Llama and Umwelt Lake Dewatering Plan, it is unclear to CIRNAC if the Licensee intends to dewater both lakes at the same time. The timing of dewatering activities should be clarified because the anticipated volume of water discharged from Llama Lake is large compared to the current volume of water in Umwelt Lake. For example, the volume of water in Umwelt Lake would increase by approximately 10% after a continuous day of pumping at the maximum rate of 23,100 m3/day, if dewatering does not proceed concurrently at Umwelt Lake. Excess water that is not contained within Umwelt Lake may contribute to enhanced overland flow and erosion, impacting water quality in recipient environments.

CIRNAC recommends that the Licensee update the Llama and Umwelt Lake Dewatering Plan to reflect the timing of its dewatering activities.

B2Gold Nunavut Response:

Dewatering of Llama and Umwelt lakes will be undertaken at the same time to the extent possible and practical. Please also see response to DFO-1. An Updated Dewatering Plan has been provided with these responses.