



Environmental  
Assessment Office

# **EAO's Assessment of an Application for Amendment**

*Red Chris Porphyry Copper-Gold Mine Project,  
EA Certificate #M05-02*

*Amendment #2 (Water Management and South Dam Design Changes)*

**Requested by:**

**Red Chris Development Company Ltd.**

**August 19, 2016**

*Pursuant to Section 19 of the Environmental Assessment Act, S.B.C. 2002, c.43*

# 1. OVERVIEW OF PROPOSED AMENDMENT

On April 5, 2016, Red Chris Development Company Ltd. (RCDC) submitted an Amendment Application (Amendment Application) to the Environmental Assessment Office (EAO) to amend its Environmental Assessment Certificate (EAC) related to Red Chris Porphyry Copper-Gold Mine Project (Red Chris Mine) design changes associated with the South Dam and water management of the tailings impoundment area (TIA). After considering feedback from the members of the Mine Review Committee (MRC; acting as the EAO Working Group) and EAO, RCDC submitted a revised Amendment Application on May 27, 2016, that included additional design changes from the April 5, 2016, Amendment Application. In the revised Amendment Application, RCDC requested the following changes to the commitments of its EAC:

- Amend commitment G10 of its EAC to reflect the diversion (non-specific to the type of diversion) and area being diverted (rather than flow quantity);
- Amend commitment M11 to reflect construction of the South Dam with a sand and gravel design rather than a constructed till core dam tied into native till; this design was subsequently updated to also include a partial liner; and
- Amend commitment M12 to remove the requirement for groundwater relief wells for the South Dam and allow the seepage recovery well design to be tied into a constructed till blanket rather than native till.

## Background

RCDC is currently operating the open-pit Red Chris Mine located approximately 18 kilometres southeast of the village of Iskut and 80 kilometres south of Dease Lake. An EAC (#M05-02) was issued for Red Chris Mine on August 24, 2005. The EAC included nine conditions, a schedule of documentation and correspondence, and a schedule of over 200 commitments made by RCDC related to Project mitigation and monitoring. The EAC was extended on July 9, 2010. An amendment (Amendment #1) to the EAC was issued on February 24, 2012, which added a requirement for compliance reporting and resulted in changes to Condition 1 of the EAC to reflect more recent language for proposed Project changes.

Construction began after a *Mines Act* (MA) permit was issued on May 4, 2012, along with other construction and operations permits and the Red Chris Mine has been in operation since 2015. On April 11, 2016, RCDC submitted a joint application to amend MA permit (M-240) and *Environmental Management Act* (EMA) Effluent Discharge Permit (PE-105017). These amendments are also required for the construction and operation of the South Dam based on the proposed changes to the dam and water management design by RCDC.

The Red Chris Mine is located within the Tahltan Nation's (Tahltan) asserted traditional territory. Tahltan and the Province are committed to implementing a robust engagement process for addressing the many operational, technical, and regulatory issues related to the design, construction and operation of the Red Chris Mine through the draft Red Chris Mine Agreement (see section 5.0 below). For this EAC amendment and the associated permit amendments, the Province worked collaboratively with the Tahltan Central Government (which represents the Tahltan Band, Iskut Band and the Tahltan Nation as a

whole) as represented by the Tahltan Heritage Resources and Environmental Assessment Team (THREAT).

## 2. SUMMARY OF AMENDMENT APPLICATION

### Rationale for the Requested Amendment

RCDC conducted further geotechnical and hydrological assessments since the original EAC and this new information resulted in: (1) proposed changes to the design for water management structures around the TIA, and (2) proposed changes to the design for the South Dam.

#### (1) Water management changes (commitment G10)

Commitment G10 of the EAC relates to mitigation of reduced flows in Trail Creek during operations by constructing a diversion ditch along the eastside of the TIA to direct approximately 30 percent of the original Trail Creek flows into Trail Creek downstream of the South Reclaim pond.

New information regarding surface and subsurface water flows around the TIA and Trail Creek resulted in the proposed change to commitment G10 in the EAC. RCDC continues to be committed to building a diversion, but their concern is that a ditch may not be effective because they state that the majority of water tends to move into Trail Creek as groundwater rather than surface water due to the porous nature of the substrate. This means that a ditch could result in low conveyance efficiency. Flexibility in design of the diversion would allow RCDC to build a structure that best conveys water in relation to conditions at the site.

The Amendment Application also requests that commitment G10 be changed to focus on capturing a drainage area, rather than setting out a specific amount of water to capture (G10 specifies “...approximately 30 percent of original Trail Creek flows...”) as it is difficult to measure the amount of flows given the complex groundwater-surface water regime at the site.

#### (2) South Dam design changes (commitments M11 and M12)

##### *Commitment M11*

Commitment M11 relates to seepage reduction and dam design measures intended to limit the rate of seepage from the TIA.

The original South Dam design described in the EAC Application included a central core of compacted, low permeability glacial till. The core was to be tied into what was believed to be a continuous till layer, which would form a natural foundation, and was to be connected to the foundation via a cutoff trench excavated through the upper aquifer. Subsequent site investigations carried out in 2010 by RCDC confirmed that the till blanket within the footprint of the South Dam area is discontinuous, and therefore, the South Dam design was changed to a

sand dam with a sand and gravel starter dam, and a cyclone sand shell with an under-drainage layer comprising sand and gravel and a 300 m wide tailings beach upstream of the dam for seepage control.

The Amendment Application states that seepage analyses have demonstrated that the proposed design change to the South Dam that includes the 300 m wide tailings beach is as effective at limiting seepage through the dam and the tailings, as a design that includes a till core and till blanket.

During the Amendment Application, review members of the MRC raised concerns relating to uncertainties in RCDC's modelling of seepage. In consideration of MRC comments, RCDC proposed to include a partial geosynthetic liner to the South Starter Dam to reduce seepage during the initial stages of construction.

#### *Commitment M12*

Commitment M12 relates to seepage control measures to mitigate the impact of the associated seepage pressures in the stability of the North and South Dams.

The lack of a continuous till blanket around the proposed South Dam location requires changes to M12 because there is a specific reference to the seepage dams (also called reclaim dams) being tied into the native till blanket in this commitment. Without this native till blanket, RCDC proposed to build the seepage dams with a constructed till blanket. The new South Dam design incorporates underdrains in addition to drainage provided by existing foundation materials, and as such, groundwater wells are considered by RCDC as unnecessary for pressure relief. Therefore, the reference to groundwater wells was requested to be removed for the South Dam.

RCDC's seepage analyses demonstrated that the proposed South Dam design, including above-water tailings beaches, tailings blanket, and underdrains, are not anticipated to change seepage rates or stability from the 2004 design.

### **3. AMENDMENT REVIEW PROCESS**

In consideration of the Amendment Application and the required permit amendments, EAO worked with the Major Mines Permitting Office (MMPO) to coordinate the review of the proposed amendments. The coordinated amendment review process with EAO and MMPO was established to ensure efficient use of resources given the overlap of technical review and consultation required for the proposed amendments. The process made use of the MRC established for the Red Chris Mine pursuant to section 9 of the MA and Part 10.3.1 of the Health Safety and Reclamation Code for Mines in British Columbia. EAO distributed the Amendment Application to the MRC for review and comment. The MRC includes membership by Tahltan, local governments (District of Stewart and Regional District of Kitimat Stikine), Northern Health, Ministry of Environment (MoE), Ministry of Forests, Lands and Natural Resource

Operations (MFLNRO), Fisheries and Oceans Canada (DFO), Ministry of Energy and Mines (MEM), and Alaska Department of Natural Resources (ADNR).

Based on the request to amend EAC #M05-02, EAO determined the following levels of engagement:

- For public consultation, a two-week public comment period was carried out to allow public input to these design changes. This period was determined based on public interest in dam design and safety due to the Mount Polley Mine dam breach in 2014, the low number of public comments on the original EAC Application, remote Project location, technical nature of change in dam design, and a desire to allow BC and Alaska public to provide input. The public comment period was advertised in both BC and Alaska one week prior to the two-week comment period. Based on public comments received requesting additional time, EAO carried out a supplemental public comment period for 10 days to allow for additional public review. Public comments are summarized in section 6.0.
- Potential adverse economic, social, health, and heritage effects were viewed as low to nil. Potential adverse environmental effects were viewed as moderate due to the changes in dam design and water management and therefore, the MRC conducted a technical review of the Amendment Application with multiple opportunities to provide comments. RCDC responded to all comments received from MRC members and MRC members were provided the opportunity to comment on the adequacy of RCDC's responses. Comments received from the MRC on the Amendment Application are summarized in section 4.0.
- The draft Red Chris Management Agreement (described in section 5.0 below) was followed to determine the appropriate consultation level with Tahltan. Tahltan participated as active members of the MRC and collaborated in the development of the coordinated review process. Further information is described in section 5.0.

EAO circulated draft decision materials, including this summary and proposed amendment to conditions, to the Tahltan, RCDC and the MRC, for comment and revised the drafts in consideration of their input.

## **4. SUMMARY OF ISSUES AND EFFECTS**

Comments on the Amendment Application were received from DFO, MoE, MEM, Tahltan, and ADNR (see the MRC and Tahltan Issues Tracking Tables posted on EAO's website).

### Water management changes (G10)

Some initial concerns were raised by MoE, MEM, DFO and Tahltan with RCDC's first Amendment Application (April 5), where RCDC proposed to remove the G10 commitment completely and not construct a diversion ditch along the east side of the TIA. MoE found insufficient evidence to suggest that this ditch "would be unlikely to deliver much if any water to Trail Creek downstream of the dam" as indicated by RCDC. MoE had concerns related to the water balance as they believed that exclusion of the east diversion ditch would increase the water contributing to the TIA. Tahltan and MEM also shared these concerns. DFO expressed concern with the removal of the east diversion ditch related to potential effects on fish and fish habitat in Lower Trail Creek.

In response, RCDC submitted a revised Amendment Application (May 27, 2016) where they committed to build an east diversion structure but requested that the reference to a “ditch” and specific amount of flow diverted be removed from commitment G10. MoE had no objections to the revised wording proposed in the revised Amendment Application, but noted that there is considerable uncertainty in the hydrologic analysis as no measured data are currently available to characterize flow in the hillslope tributaries or in lower Trail Creek. RCDC will finalize the specific design features of the east diversion during the EMA permit amendment process and any residual concerns of MoE would be addressed at that time. MEM, Tahltan and DFO had no further concerns specific to the east diversion commitment changes.

EAO refined proposed amendments to G10 with input from Tahltan, MoE, MEM and RCDC, to reflect the changes requested by RCDC, current EAC policy and subsequent permitting processes that would constrain the design of the diversion and include requirements for monitoring the effectiveness of the diversion.

Based on the review of RCDC’s Amendment Application and supplemental information, as well as comments from the public, Tahltan and the MRC and RCDC’s responses to these comments, EAO’s view is that the proposed amendment to G10 is unlikely to change the residual effects identified in EAO’s assessment of the original water management measures.

#### South Dam design changes (M11 and M12)

Initially MoE, Tahltan, and MEM raised concerns around seepage and potential effects on the water balance model and water quality downstream of the TIA as a result of the South Dam design changes specific to M11. However, RCDC’s proposal for a partial liner and the resulting seepage reduction alleviated most of these concerns. MoE stated that given the additional environmental protection mechanism of the partial liner, the uncertainties related to the seepage modelling can be managed through contingencies. MoE noted that the best contingency to protect against water quality issues that may potentially result from TIA supernatant is treatment of source water, compared to groundwater interception, pump back and/or treatment. Northern Health supported MoE’s comment. In order to strengthen the EAC to reflect this, MoE recommended changes to F10, F12 and F13. MEM also recommended changes to these commitments to include the requirement for water treatment of TIA supernatant as a contingency if it does not meet discharge criteria for water quality.

RCDC was not in support of changes to commitments F10, F12, and F13 as proposed by MoE because they felt the proposed changes were too prescriptive and did not allow for potentially technically superior water management or treatment options. MoE clarified that the intention in the suggested EAC commitment changes was to add clarity to the contingency options, to reflect MoE’s view that treatment of contact water is a preferable contingency measure to groundwater capture and pump back. RCDC’s view was that MoE was proposing a change to the way that water discharge at Red Chris Mine is regulated. RCDC stated that to date, the concept has been to protect the receiving environment and the compliance point has been located to do that. RCDC stated that additional certainty and conservatism is provided by the inclusion of a partial liner in the South Starter Dam design.

RCDC also noted they developed a water quality monitoring and mitigation plan as part of their MA/EMA permit amendment application which accounts for the uncertainties associated with the evolution of water quality in the TIA, such as fluctuations in selenium loadings and attenuation, attenuation of nitrate, and rates of groundwater flows away from the facility.

While EAO agrees that the wording within commitments F10, F12 and F13 provide flexibility to RCDC around water treatment, RCDC is still bound by EMA water quality discharge requirements. EAO notes that the MA permit contains conditions relating to water treatment and MoE has the ability under the current EMA permit amendment to specify requirements for water treatment. EAO also notes that amendments to EACs are initiated by EAC holders. As such, EAO is not recommending changes to these commitments.

MoE, MEM, and Tahltan had no concerns with proposed wording changes for M12.

ADNR reviewed the Amendment Application and was concerned with long-term planning and dam design at closure. ADNR requested information on static settlement and consolidation with consideration for seismic deformation for the South Dam design. RCDC is still in the process of developing the closure layout and has committed to updating consolidation testing and modeling to represent operational and closure/post closure tailings deposition layout by mid-2017. RCDC will also address ADNR concerns regarding additional engineering evaluations, dam surveys and quantifiable performance objectives through the development of an Operation, Maintenance and Surveillance Manual and MEM permit requirements for annual surveys and reporting on dam safety. ADNR was satisfied with RCDC's responses and indicated to EAO that their concerns had been addressed.

EAO refined proposed amendments to M11 and M12 with input from Tahltan, MoE, MEM and RCDC to reflect the changes requested by RCDC, current EAC policy and recognizing that the MA and/or EMA permit amendment would prescribe the design of the seepage reduction measures including the specifications of the partial geosynthetic liner, the number and location of groundwater and seepage recovery wells and include requirements for monitoring the effectiveness of the seepage reduction and mitigation measures.

Based on the review of RCDC's Amendment Application and supplemental information including the addition of a partial geosynthetic liner to the design, as well as comments from the public, Tahltan and the MRC and RCDC's responses to these comments, EAO's view is that the proposed amendments to M11 and M12 are unlikely to change the residual effects identified in EAO's assessment of the original South Dam design related to seepage reduction measures.

## **5. ABORIGINAL CONSULTATION**

Tahltan worked with the Province and RCDC during the original EA in 2005, and RCDC and Tahltan have an Impact, Benefit and Co-Management Agreement for the Red Chris Mine that outlines the relationship, opportunities and commitments. Tahltan are members of several committees and groups for the Red Chris Mine including the Red Chris Monitoring Committee, Project Advisory Committee,

Environmental Oversight Committee, Socio-Cultural Committee, and have regular engagement with RCDC.

Tahltan and the Province are currently in the final stages of drafting a Red Chris Management Agreement. Through this Agreement, Tahltan and the Province are establishing a Project-specific relationship regarding the development, construction, operation, and closure of the Red Chris Mine, environmental management, as well as the monitoring and enforcement of technical and environmental measures related to the Red Chris Mine. In the current draft Management Agreement, the Parties agree to use the Application Review Procedures set out in the Management Agreement for Provincial Authorizations and proposed amendments to existing Provincial Authorizations for the Red Chris Mine.

In following the draft Application Review Procedures, Tahltan and the Province developed a Red Chris Project Charter in collaboration with RCDC for the proposed South Dam amendments. The Project Charter outlines the roles and responsibilities of RCDC, the Province and Tahltan, and includes the collaborative development of the Project review schedule and the coordinated review process. The coordinated review process provided a venue for issues resolution and comprehensive review of concerns brought forward by Tahltan.

Since early December 2015, the Province and Tahltan, as represented by THREAT, have been working collaboratively to develop information requirements and design the coordinated review process. At the end of each phase of the coordinated review process, the Province and THREAT had comprehensive review meetings (April 8, July 20 and August 9, 2016), and reviewed unresolved issues with the goal of striving to reach consensus recommendations for decision makers. THREAT was also an active member of the MRC and as such, was given time to review documents, provide comments for tracking and receive responses to their concerns. THREAT attended in-person meetings of the MRC (April 7 and May 5, 2016) and bi-weekly MRC check-in conference calls (starting mid-May through mid-August 2016).

For this amendment, EAO provided Tahltan with \$2,000 of capacity funding to support their participation in the amendment review process.

EAO and MMPO conducted a community meeting in Dease Lake to engage with the Tahltan community on May 30, 2016. This forum provided communities with an introduction to the proposed amendments and the review process, and facilitated community engagement on various aspects of the proposed amendments that were of interest to Tahltan. This meeting provided an opportunity for community members to ask questions directly to RCDC, the Province, and THREAT. Forty questions/comments were received from members of the community at the meeting and RCDC responded to all comments at the meeting and in the issues tracking table.

The main concern that surfaced from this meeting was related to potentially high selenium levels in fish tissues in Ealue Lake. RCDC stated that there is no known connection between mine development and selenium concentrations in Ealue Lake (i.e., drainage from the Red Chris Mine does not flow toward the lake), therefore the difference in selenium levels between years is considered to be natural year-to-year variability. MoE considered the potential to be low for the Red Chris Mine to affect selenium levels in



Ealue Lake and that the recent selenium levels seem to be similar to earlier measurements prior to the Red Chris Mine. MoE will continue to work with RCDC on water management issues and water quality as part of the EMA permit for the Red Chris Mine.

During the Amendment Application review, THREAT identified the importance of the Project area including maintaining water quality to ensure that downstream resources are protected for the Tahltan people who continue to exercise Tahltan cultural and subsistence activities in this area. Tahltan stated that environmental management and protection of Tahltan lands is a priority.

THREAT reviewed the Amendment Application and, as noted above in section 4.0, had concerns with the proposed changes to water management (G10) and South Dam design changes (M11 and M12). These comments and concerns were captured in the Tahltan Issues Tracking Table.

For G10, THREAT was in agreement with MoE and MEM that the revised Amendment Application addressed the concerns raised and THREAT will have further opportunity to provide input to the design of the east diversion through the EMA permit process.

For M11 and M12, THREAT had similar concerns to MoE and MEM regarding seepage and potential effects on the water balance model and water quality downstream of the TIA with the original proposed South Dam design. In their initial comments, THREAT suggested that a till liner may be feasible and requested additional information on considerations for additional seepage reduction measures.

The addition of a partial geosynthetic liner put forth by RCDC substantially addressed a number of THREAT concerns. Specifically, THREAT commented that the partial liner would assist in the reduction of seepage and reduces the uncertainties THREAT had identified in a number of their comments regarding seepage rates and flow paths during initial commissioning and early operations of the South Dam. THREAT also stated that the liner would have a substantial influence on reducing the initial rate of seepage from the starter impoundment, resulting in significantly less degradation of the groundwater regime downstream of the South Dam in the short term, compared to an unlined impoundment. In their comments to EAO, THREAT provided their support for the liner indicating that it meets the intent of commitments M11 and M12 to limit seepage from the TIA to the receiving environment.

Additional information regarding details requested by THREAT on seepage recovery plans, water quality and quantity for Lower Trail Creek, quantifiable performance objectives, groundwater discharge, hydrological modelling and Muck modelling will be addressed through the EMA permit amendment process (see Issues Tracking Table). THREAT comments on soil management for reclamation and on topsoil within the South TIA footprint will be addressed through the MA permit amendment process (see Issues Tracking Table).

## **6. PUBLIC CONSULTATION**

For public consultation, a two-week public comment period was carried out to allow public input to these design changes. This period was determined based on public interest in dam design and safety

due to the Mount Polley Mine dam breach in 2014, the low number of public comments on the EAC Application, remote Project location, technical nature of change in dam design, and a desire to allow BC and Alaska public to provide input. The public comment period was advertised in both BC and Alaska one week prior to the two-week comment period. Based on public comments received requesting additional time, EAO carried out a supplemental public comment period for ten days to allow for additional public review.

EAO received nine comments from the public during the public comment period (see the Public Issues Tracking Table).

The following table summarizes the key issues raised by the public, RCDC’s responses, and EAO’s conclusions on the resolution of these issues.

Subject	RCDC Response	EAO Conclusion
Mount Polley panel recommendations	<p>In terms of implementing recommendations made by the Mount Polley Panel (Government of British Columbia 2015) to improve practice and reduce the potential for future failures, RCDC has incorporated best available technology (BAT) and best available practices (BAP) in the TIA design, implemented an Independent Engineering Review Panel, and reviewed technical issues such as filter adequacy and foundation strength.</p> <p>Examples of BAT include: minimization of excess surface water from the impoundment, promotion of unsaturated conditions in the tailings with drainage provisions in the immediate upstream area of the dam, and achievement of dilatant conditions throughout the tailings deposit by compaction.</p> <p>Examples of BAP include development of a risk register and a failure modes and effects assessment, recognition of water management requirements through closure, inclusion of an additional mill circuit to separate tailings fractions, and inclusion of a large tailings beach and active management of the pond location and size.</p>	<p>EAO required RCDC to include consideration of BAT in the Amendment Application.</p> <p>EAO is satisfied that RCDC has considered the Mount Polley panel recommendations for an existing facility in the proposed South Dam design.</p>



<p>Potential for impacts to transboundary watersheds</p>	<p>Risk to downstream watersheds is mitigated through the Red Chris Mine Aquatic Effects Monitoring Program (AEMP). The AEMP was designed to meet EMA permit requirements, environmental effects monitoring requirements in accordance with the federal Metal Mining Effluent Regulations pursuant to the <i>Fisheries Act</i>, and other monitoring commitments identified in the EAC.</p> <p>RCDC has revised the design of the South Starter Dam to include a partial geosynthetic liner to reduce the uncertainty identified by public, regulators and First Nations regarding seepage rates and flow paths during initial commissioning and early operations of the TIA. In addition, geotechnical and groundwater quality monitoring will be carried out and compared to specific Quality Performance Objectives and associated Trigger-Action-Response Plans developed in consultation with MoE and MEM to protect the downstream environment.</p>	<p>RCDC has an AEMP to address potential downstream water quality impacts. RCDC is also required to conduct geotechnical and groundwater quality monitoring in order to protect the downstream environment. EAO is satisfied that the potential for downstream water quality effects has been addressed.</p>
<p>Financial surety</p>	<p>The Red Chris Mine carries a reclamation bond with MEM to cover the closure and reclamation costs.</p>	<p>Financial security is addressed through the MA permit.</p>
<p>Ability to maintain appropriately sized tailings beaches and the potential for resaturation and resulting reduced dam safety</p>	<p>The ability to proactively manage the TIA with permitted water discharge will allow the required beach length to be maintained. The beach width parameter will be a set performance objective for the facility.</p>	<p>The requirement for tailings beaches above water against the South Dam is included in the proposed amendment to M11. The MA permit will require that the minimum beach width be included as a quantitative performance objective.</p>



Potential effects from seismic events	The potential for significant seismic events has been accounted for in the TIA design. For both the South Dam and South Reclaim Dam, the design criteria selected for earthquake ground motion exceeds the values recommended by the Canadian Dam Association (2013) for structures of the same consequence classifications.	EAO is satisfied that the potential for effects from seismic events has been considered in the South Dam design.
---------------------------------------	--	--

## 7. CONCLUSIONS

Based on:

- The information contained in the Amendment Application and supplemental information provided during the Amendment Application review;
- Comments on the Amendment Application by Tahltan, federal and provincial government agencies and ADNR, as members of the MRC, and RCDC's responses to these comments;
- Comments on the Amendment Application by the public and RCDC's responses to these comments;
- Red Chris Mine would be subject to subsequent permitting approvals under the MA and EMA; and
- The engagement of Tahltan as per the draft Red Chris Management Agreement, Application Review Procedures, and Project Charter during the amendment process.

EAO is satisfied that:

- The amendment assessment has adequately identified and assessed the potential changes to the adverse environmental, economic, social, heritage and health effects resulting from the proposed amendment;
- Issues identified during review of the Amendment Application, which were within the scope of the assessment of the proposed EA amendment, were adequately and reasonably addressed by RCDC;
- Practical means have been identified to prevent or reduce any potential adverse environmental, economic, social, heritage and health effects of the proposed amendment such that no significant adverse effect is predicted or expected as a result of this proposed amendment;
- The potential for adverse effects on asserted or established Aboriginal rights including Aboriginal title of Tahltan has been avoided, minimized or otherwise accommodated to an acceptable level; and
- The provincial Crown has fulfilled its obligations for consultation and accommodation to Tahltan relating to the issuance of an amendment to EAC #M05-02.

