

April 4, 2016

Fern Stockman, Project Assessment Manager
Environmental Assessment Office
PO Box 9426 Stn Prov Govt
Victoria, BC, V8W 9V1
Canada

Dear Fern:

Re: Red Chris Certificate #M05-02 Amendments

In accordance with Section 19 of the British Columbia *Environmental Assessment Act*, Red Chris Development Company Ltd. (RCDC) is submitting this amendment request to revise the Table of Commitments set out in Schedule B of Environmental Assessment (EA) Certificate #M05-02.

The proposed amendments are for commitments identified that are related to the proposed construction of the South Dam in the Tailings Impoundment Area (TIA), namely commitments G10, M11 and M12.

The currently proposed dam design has been updated from a till core design proposed in the original EA application of 2004 to a sand dam design. The sand dam design was included in the RCDC joint application for *Mines Act* and *Environmental Management Act* permitting in 2010 and was further detailed in the June 2011 AMEC design report. The updated design was scrutinized during the Robertson GeoConsultants (2012) and the Klohn Crippen Berger (2014) 3rd party reviews, and has been further considered under the ongoing Red Chris Independent Engineering Review Panel. The current design was presented to the public and Tahltan communities, where the South Dam was referred to as a sand dam during several dozen community meetings since 2010.

The EA amendments have been specifically discussed most recently with Tahltan representatives during 2016 meetings on February 10 and February 17 in Vancouver, in advance of this submission. These amendments, while supported by current documentation in this submission, will also be a part of more detailed technical discussions in the coordinated EA amendment/regulatory permitting process. Tahltan, through RCDC, have submitted a consultation plan that is proposed for this coordinated Mine Review Committee (MRC) process.

The attached First Nations Consultation log shows communications related to the TIA and is accompanied by a summary describing the different components of that consultative discussion. Public consultation for the Red Chris project is sometimes synonymous with First Nations consultation because the surrounding communities of Telegraph Creek and Iskut are First Nations communities and Dease Lake is a mixed community with a little more than half of the population being First Nations. Meetings held in Dease Lake were open to the public and were attended by First Nations and non-First Nations community members. The Metal Mining Effluent Regulations public consultation regarding the South Dam included public meetings in Dease Lake, Iskut, Telegraph Creek, Smithers and Ottawa. The public has also been informed through public meetings and gazetting, with access to documents throughout the regulatory permitting processes, as they will be with the upcoming regulatory and EA Amendment coordinated process.

The BC Premier Christy Clark and Alaska Governor Bill Walker signed a Memorandum of Understanding that strengthens cross-border relations on matters relating to mining and other areas of common interest. Alaska was part of the working group for the EA process in 2004 and 2005, and during the regulatory permitting in 2010 through 2012 the State of Alaska was well represented by its Department of Natural Resources, Department of Fish and Game, National Marine Fisheries Service, Office of Project Management & Permitting from the Department of Natural Resources, and the Environmental Protection Agency. RCDC expects that there will be similar engagement with Alaskans with their representatives in the upcoming coordinated process.

An EA Amendment typically includes consideration of Valued Components impacts assessment relevant to the proposed amendment. For this EA amendment request, RCDC demonstrates that the proposed dam design change will not result in a change to the area of disturbance, nor will it change the physical impact to the area of consideration. In addition, the supporting discussion provided by BGC Engineering Inc. (BGC) shows that there is no change to the volume of seepage as a result of the design change to the dam. Since seepage volume or pathways will not be affected by the design change, by extension, the seepage quality will also be unaffected by the design change. Therefore, there is no potential for change to the impacts to Valued Components from the original assessment and further analysis of Valued Components under this amendment will not be useful or necessary.

Included as a part of this submission, RCDC has included an abbreviated version of the Table of Commitments from EA Certificate #M05-02 showing only those commitments that RCDC proposes for amendment. Each proposed amendment also provides the following:

- A description of the proposed project changes;
- RCDC's understanding of the intent of the original commitment
- Reason for the proposed changes
- Conclusion of how the intent of the commitment will be maintained with the amendment

Also included in this package are the following support documents:

- Summary of First Nations Consultation related to the TIA and a summary note describing the general context of consultation, with issues raised and how they were addressed
- Options Analysis summary that describes how the decision was made to migrate from a till core design to a sand dam design; this memo also includes a discussion of how RCDC considered Best Available Technology in the engineering solution
- M11 discussion: Commitment M11 specifically referred to a till core dam, so a memo has been prepared by the Engineer of Record to address the issues related to the design change and demonstrates how the intent of the commitment is maintained
- The 2011 AMEC Design Report (without Appendices) is submitted separately due to the file size, for reference
- MRC Table of Concordance that defines the scope of technical review that will take place under the joint MRC process

RCDC hereby submits this letter application for an amendment to the EA Certificate #M05-02. Please do not hesitate to contact me if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read 'S. Robertson', with a stylized flourish at the end.

Steve Robertson P.Geo.
Vice President, Corporate Affairs
Red Chris Development Company Ltd.

Subject Area	Ref #	COMMITMENT	Comment	Agency*	Amendment Action	Timing
D. Fisheries and Aquatic Resources						
G. Water Quantity						
	G10	During operations the impact of reduced flows on Trail Creek will be mitigated by a diversion ditch constructed along the east side of the tailings impoundment that will direct approximately 30% of the original Trail Creek flows into Trail Creek downstream of the seepage control pond. This diverted water will report to Kluea Lake via Trail Creek.	The intent is to maintain sufficient water flow in Trail Creek for aquatic life. Field observations have indicated that there is very little surface flow available on the described slopes due to its highly pervious nature. Construction of the described ditch would be a significant and unnecessary disturbance, unlikely to deliver much if any water to Trail Creek downstream of the dam. The Trail Creek impacts have been compensated for in the approved off-setting plan.	MOE	Remove Not consistent with current plan and not practical to implement. The amendment will reduce the overall negative impact to the environment that would result from unnecessary physical disturbance.	Operation
M. Environmental Management						
	M11	Seepage reduction measures will be employed to limit the rate of seepage. These include the following: - The dam designs will include ~~a core of compacted, low hydraulic conductivity glacial till to the ability to~~ limit seepage through the dam. ~~The core zones for each dam will be tied into the native foundation till blanket; effectively cutting off seepage flows through the high hydraulic~~	The intent is to reduce seepage. During field investigation subsequent to EA Certificate issuance, it was observed that the assumed continuous till blanket does not exist, and as a result, following the concept of BAP/BAT, the dam has been redesigned as a sand dam. It is expected to be a pervious structure, however once	MOE	Remove and add to wording as indicated.	Operation/ Closure

Subject Area	Ref #	COMMITMENT	Comment	Agency*	Amendment Action	Timing
		~~conductivity sands and gravels comprising the upper aquifer.~~ - The tailings discharged into the impoundment will, once the impoundment is well developed beyond the first few years of operation, serve to limit the rate of seepage through the foundation soils. This will be of particular benefit in any areas where the natural glacial till blanket is discontinuous and there is direct communication between the upper and lower aquifers. - There may be a need for a deep seepage cut-off to prevent the development of unacceptably high seepage pressures in the lower aquifer.	the mandated 300 m wide beach is established, it is not expected that the phreatic water surface linked to the pond, will reach the dam. Therefore, the dam design change will have no effect on seepage. Through permitting, a comprehensive program for seepage mitigation including a seepage recovery system will adequately satisfy the intent of seepage reduction to protect the downstream environment in the event that seepage quality is poor. The concept of seepage reduction will be demonstrated during the concurrent permitting process. If that permitting satisfies the intent of seepage reduction and mitigation, then this commitment should be modified by removal or addition of wording as indicated.			
	M12	Seepage control measures used to control seepage, and to mitigate the impact of the associated seepage pressures on the stability of the North Dam and the South Dam, will include the following: - A drainage blanket of clean sand and gravel of high hydraulic conductivity will be constructed below the cycloned sand downstream shells of both the North Dam and the South Dam. - Groundwater relief wells will be constructed below the downstream shells of the North ~~and~~	The intent of the requirements stated in this commitment proposed by MoE is to relieve seepage pressures from the aquifer below the continuous till layer in order to increase stability of the dams. The intent of geotechnical stability is fulfilled in the current design. The potential groundwater flow under the South Dam area is now better understood than it was during the EA review.	MOE	Remove outdated wording as indicated.	Operation/ Closure

Subject Area	Ref #	COMMITMENT	Comment	Agency*	Amendment Action	Timing
		South Dams. These wells will extend through the till and into the underlying lower aquifer, with the objective of providing pressure relief, hence increasing effective stresses (and mobilized shear strength) in the foundation soils below the downstream shells of these two dams. - Seepage dams will be constructed downstream of the North Dam and the South Dam. These dams will be constructed of upstream and downstream granular shell fills, with a central core of compacted glacial till. ~~The core zones of both seepage dams will be keyed into the native till.~~ - Groundwater supply pumping wells will be installed immediately downstream of the seepage dams at both the North Dam and the South Dam sites. These wells will serve a dual purpose: - Limit seepage during operations, particularly in the early years prior to effective blanketing of the basin with tailings solids, from the tailings impoundment to the downstream receiving environments (Quarry Creek to the north of the North Dam, and Kluea Lake to the south of the South Dam); and - Provide fresh water makeup required for specific purposes in the milling process.	Groundwater flow is downwards and pressure relief wells in the South Dam area are not required as initially envisioned for the purposes of stability. The concepts keying the South Seepage Dam (now called the South Recovery Dam) into a continuous till layer, which is now known not to exist, should be removed. The wording highlighted is outdated and should be removed from Commitment M12 as they do not apply to the current design.			

**RED CHRIS DEVELOPMENT COMPANY LTD., RED CHRIS MINE – SOUTH DAM
CONSULTATION LOG SUMMARY**

Submitted to:

Environmental Assessment Office

In Support of:

**APPLICATION FOR AN AMENDMENT TO
EA CERTIFICATE #M05-02**

April 4, 2016

EXECUTIVE SUMMARY

Red Chris Development Company Ltd (RCDC) initiated contact with the Tahltan Band Council and Iskut First Nation, collectively referred to here as “Tahltan”, regarding the Red Chris mine project in 2003. A Memorandum of Understanding (MOU) was signed on January 19, 2004. The MOU outlined a set of principles under which RCDC and the Tahltan worked together toward development of the Red Chris mine. RCDC embarked on exploration activity while guiding the project through the Provincial and Federal Environmental Assessment (EA) Processes in 2004 - 2006. The Tahltan were kept fully informed at all stages of the EA review. Representatives from the Tahltan Band Council, Tahltan Central Council (formed to represent all Tahltan) and the Iskut First Nation participated on the interagency working committee (Working Group). On August 24, 2005 Project Approval Certificate #M05-02 was issued to RCDC, and on July 9, 2010, it was extended to be valid until 2015. The Provincial EA Certificate was also amended on February 24, 2012. Federal Canadian Environmental Assessment Act Certification was received on May 5, 2006.

First Nations Consultation provided in the attached log only includes record of consultation activity with the Tahltan since Imperial Metals became involved in the Red Chris project in 2007, and that is related to the Tailings Impoundment Area. All of the 90 Community Meetings indicated that were held during that period are included in the log because every Community meeting included a presentation summarizing the project, including a number of key elements such as the transmission line along Highway 37, an access road to the mine from Highway 37, an open pit, a concentrator and a Tailings Impoundment Area (TIA). The TIA has always been shown to have three containing features, the North Dam, South Dam and Northeast Arm Dam. During the EA application process of 2004 and 2005, the South Dam was proposed to have a “Till Core” which would tie into a continuous till blanket expected to underlie the surface in the South Dam area. Subsequent investigation determined that the till blanket was not continuous and as a result, the design for South Dam was changed from a till core structure to a sand dam. This concept of a sand dam construction for South Dam was presented in the permit application of June 2010 and further detailed in the June 2011 Design Report authored by AMEC, who were at that time the Engineer of Record for the Red Chris TIA.

The consultation log also includes numerous references to meetings with business representatives from the Tahltan community, mostly representatives of Tahltan Nation Development Corporation (TNDC). The Tahltan community in general has a long history of success as equipment operators and in 1985 TNDC was formed as a community owned business to enable the Tahltan Nation to fully participate in the economic activities and development occurring within Tahltan traditional territory. Playing to their strength of earthworks, TNDC met with RCDC frequently to discuss development of the TIA which presented the greatest contracting opportunity for the community from the mine.

The negotiation of and Impacts and Benefits Agreement (IBA) which was renamed to an Impact, Benefit and Co-Management Agreement (IBCA) late in the negotiation of the agreement, resulted in many meetings detailed in the log. The IBCA was always expected to be an important document defining the role Tahltan would play in development of the TIA, spelling out certain contracting opportunities for Tahltan as well as environmental obligations and commitments to

the Tahltan by RCDC. The IBCA is a confidential document and cannot be shared in whole, but components of the agreement can be discussed.

In response to Tahltan concerns expressed at a number of technical meetings and community meetings about seepage in the TIA, RCDC proposed a Third Party Review (TPR) of the hydrogeology conducted by a mutually acceptable and industry renowned expert. Robertson GeoConsultants were selected to conduct the TPR of hydrogeology which was completed in November of 2012.

After the August 4, 2014 dam breach at Mount Polley mine, owned by the same parent company as RCDC, RCDC agreed to fund an additional TPR to be conducted by Tahltan in the fall of 2014. The study was completed by Tahltan selected geotechnical engineers, Klohn Crippen Berger in October 2014. A sub-agreement describing the ongoing commitments to Tahltan by RCDC in respect to the design, construction and continued review of the TIA has been included as a Schedule to the IBCA.

Tahltan involvement in the Metal Mining Effluent Regulations (MMER) process has been a key cooperative Tahltan/RCDC initiative for the Red Chris project. In 2005, Tahltan and RCDC representatives met with provincial and federal regulators and achieved mutual agreement on a Fish Habitat Compensation Plan (FHCP) to be constructed at Coyote Creek. This was necessary to provide compensation for the placement of the South Dam on Trail Creek that is currently determined to be Fish Habitat. After the Coyote Creek FHCP was fully developed, Tahltan raised concerns that despite its low ranking, Coyote Creek was actually observed to be a very productive creek and should not be disturbed. Tahltan and their consultants worked closely with RCDC to select a new FHCP at Snapper Creek. This project will focus on removal of a fish barrier on Snapper Creek, allowing fish to access many kilometers of historically utilized fish spawning and rearing habitat that will support a traditional Tahltan fishery in Kinaskan Lake. The FHCP has been rewritten as an Off-setting Plan to comply with the updated Fisheries Act.

The documented consultation with Tahltan attached in the associated Consultation Log represents only a small proportion of overall extensive interaction between Tahltan and RCDC related to the Red Chris mine. The establishment of the IBCA, the Red Chris Monitoring Committee, Project Advisory Committee, Environmental Oversight Committee, Socio-Cultural Committee, Water Working Group, Wildlife Working Group and numerous other venues for continued interaction will ensure that open, frequent and meaningful consultation will continue for the life of the project and beyond. In addition the IBCA establishes a target for a minimum of 40% Tahltan employment at the Red Chris mine. The employment rate has consistently been over 30% since the mine began operations and there is no indication that the growth rate of Tahltan employment will plateau in the near term.

RED CHRIS MINE DEVELOPMENT / ISKUT EXTENSION TRANSMISSION LINE: CONSULTATION RECORD (2007-2014)

Revised: Feb 03 2014

PARTIES: RED CHRIS DEVELOPMENT COMPANY LTD. / TAHLTAN CENTRAL COUNCIL

Key of abbreviated terms and names at the end of the consultation log

Item No.	Date (yyyymmdd)	Participants		Method	Location	Subject / Summary	Outcomes
		RCDC	Tahltan				
	2007						
	2007-05-08	Brian, Pierre, Steve, Ron	Tahltan Leadership Council	Meeting	Dease Lake	Introductory Meeting for the Imperial Metals group	Introduction of Imperial Metals to the leadership and heard about Tahltan concerns related to Red Chris. Most concerns related to TK
	2007-05-15	Brian, Steve, Ron	THREAT	Meeting	Smithers	Introductory Meeting for the Imperial Metals group	Introduced Imperial and presented Red Chris project. Lots of discussion about TK and Archaeology
	2007-06-25	Brian, Steve, Raj	Klabona Keepers	Meeting	Klabona Learning Centre	Introductory Meeting for the Imperial Metals group	Introduced Imperial and made impression that company is an operator, not a seller, and we will be in the community for a longtime to come. We want to be a good neighbor and hear concerns and needs.
	2007-08-10	Brian, Steve, Raj	THREAT (Nalaine, Cynthia, Camille)	Meeting	Imperial Office	Progress Meeting	THREAT introduced idea of the Heritage Dept being contracted to do a TK study
	2007-09-13	Brian, Steve, Raj	Tahltan Central Council (Curtis, Cynthia)	Meeting	Cynthia's office	Progress Meeting	
	2007-09-18	Steve	Camille	Telephone		TK Agreement	
	2007-09-19	Steve	Cynthia	E-mail		Summary of Activities	
	2007-09-21	Steve, Raj	THREAT (Camille)	Meeting	Vancouver	TK Agreement	
	2007-10-26	Steve, Raj	TCC (Camille, Michael)	Meeting	Imperial Office	TK Agreement	
	2007-11-08					TK Agreement	
	2007-11-16	Brian, Pierre, Steve, Don, Raj	TCC (Nalaine, Jerry, Freddie, Camille and by tel. Christine and Eileen)	Meeting	Imperial Office	Project update Meeting	
	2008						
	2008-01-29	Brian, Pierre, Steve, Don, Raj	TCC (Nalaine, Jerry, Stan, Camille, Ramona, Annita, Geraldine, Gord)	Meeting	Imperial Office	Project update Meeting	Summary of results from 2007 drilling and discussed company idea of what 2008 program would look like. Road building first
	2008-02-29	Brian, Steve, Raj	Jerry	Meeting	Hyatt Regency	Progress Meeting	
	2008-05-13	Steve	Klabona Keepers, Rhoda Quock	Telephone		Discussion of upcoming program	
	2008-07-22	Steve, Raj	Arnold	Meeting	Imperial Office	Update	business opportunity meeting.
	2008-08-28	Steve	THREAT (Ken Rabbnet)	Telephone		Inquiry about archaeology	Company phoned to ask the outcome of his field work in TIA
	2008-09-03	Imperial executives	TCC Executives	Meeting	Imperial Office	Project review	
	2008-09-29	Brian, Steve, Raj	Annita plus one councillor	Meeting	Dease Lake	Leadership Meeting	
	2009						
	2009-01-28	Steve	Nalaine	Meeting	Westin Bayshore restaurant	Project update	

RED CHRIS MINE DEVELOPMENT / ISKUT EXTENSION TRANSMISSION LINE: CONSULTATION RECORD (2007-2014)

Revised: Feb 03 2014

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Key of abbreviated terms and names at the end of the consultation log

Item No.	Date (yyyymmdd)	Participants		Method	Location	Subject / Summary	Outcomes
		RCDC	Tahltan				
	2009-05-07	Steve, Raj	Bill	Telephone		TNDC business opportunity	
	2009-07-15	Steve, Raj	Bill	Meeting	Imperial Office	Project update	
	2009-08-17	Steve, Raj	Steve Seigner, Arnold	Meeting	Imperial Office	Business opportunities	
	2009-09-04	Steve, Raj	Bill	Meeting	Imperial Office	Project update	
	2009-09-22	Steve, Raj	Bill, Darryl Bell	Meeting	Imperial Office	Project update	
	2010						
	2010-01-18	Steve, Raj	Bill	Meeting	Westin Bayshore	TNDC Reception	
	2010-01-21	Steve, Raj	TCC	Meeting	Imperial Office	Project update	Annual update meeting to discuss previous year and plans for year to come
	2010-02-08	Steve	Arnold	E-mails		Query about future work	
	2010-02-08	Steve	Arnold	E-mail from Arnold		Query about future work	
	2010-02-08	Steve	Bill	Meeting	Imperial Office	Project update	
	2010-02-19	Steve	Arnold, Bill	Meeting	Imperial Office	Project update	
	2010-02-24	Steve, Raj	Ed	Telephone		TNDC business opportunities	
	2010-04-01	Steve, Raj	Bill	Meeting	Imperial Office	Project update	
	2010-04-20	Byng	Annita	Lunch Meeting	Fairmont Pacific Rim, Vancouver	Moving forward to improve relationships. Discussion as to how RCDC wants to consult more and interact more. Clear discussion that a full “no” would not work for RCDC and a full “yes” was difficult for TCC. Work together for a “yes, but...” arrangement.	Agreement for RCDC to fund internal community consultation Meetings, agree to fund THREAT participation at NWMDRC at approximately \$101k in incremental payments. Also commitment to provide financial support for TCC upcoming strategy session in Terrace.
	2010-04-30	Steve	Arnold	E-mail		Query about hiring and logging	
	2010-05-03	Steve, Raj	Bill Adsit	Meeting	Imperial Office	Project update	
	2010-05-17	Byng	Norm, THREAT	Conference call		Discussion of THREAT funding and participation	
	2010-05-28	Byng, Steve	Marie	Telephone	Red Chris Site	Planned visit by Iskut Chief and Council cancelled	
	2010-07-12	Steve	Ed Asp	Telephone		Business opportunities	
	2010-07-13	Byng	Bill, TNDC	Meeting	Imperial Office	General discussion regarding contracting opportunities at the Mine for TNDC.	
	2010-07-27	Byng	Brian Callious	E-mail to arrange conference call with Annita McPhee		Follow up discussion to June internal Tahltan Meetings and planning for further community Meeting for September which would include Imperial Metals.	
	2010-07-29	Byng	Annita, Brian Calliou, Banff Centre	Conference call		Conference call with Annita McPhee and Brian Calliou of the Banff Centre re: preparation for September community Meetings	
	2010-08-19	Byng	Dwayne Day, THREAT	Invitation for site visit	Red Chris mine site	Dwayne Day of THREAT joined the visit. Following the departure of BC Mines Minister Hawes, Byng Giraud, Gord Keevil and Dwayne Day visited the proposed Tailings facility.	

RED CHRIS MINE DEVELOPMENT / ISKUT EXTENSION TRANSMISSION LINE: CONSULTATION RECORD (2007-2014)

Revised: Feb 03 2014

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Key of abbreviated terms and names at the end of the consultation log

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		RCDC	Tahltan				
	2010-08-20	Byng	TCC	Meeting	???	Imperial Metals staff met with the TCC. Unfortunately scheduling conflicts resulted in a truncated Meeting. Some questions did take place.	
	2010-08-25	Steve, Raj	Bill	Meeting	Imperial Office	Project update	
	2010-08-31	Byng	Norm, THREAT	E-mail		Re: invoicing and Meeting dates. Ensuring THREAT is receiving Timely funding for NWMDRC participation.	
	2010-09-09	Byng	NWMDRC	Meeting	Smithers	Participation by THREAT	
	2010-09-13	Byng	Tahltan members	Open house	Red Chris mine site	RCDC hosted an open house attended by approximately 60 Tahltan members (not including RCDC employed Tahltans). A tour and briefing on the project was provided including a Q&A.	
	2010-09-14	Byng	Tahltan members	Communitiy Meetings	Telegraph Creek	Facilitated by the Banff Centre a community Meeting was held in Telegraph Creek. RCDC provided staff and consultants to present and answer questions. Staff included Brian Kynoch, President & CEO, Raj Anand, Project Engineer, Steve Robertson, Exploration Manager and Byng Giraud, VP Corporate Affairs. Consultants covering areas of fisheries, TIA and wildlife were also in attendance. Approximately 10 Tahltan were in attendance.	
	2010-09-15	Byng	Tahltan members	Communitiy Meetings	Iskut	As per September 14 th . Approximately X Tahltan were in attendance.	In addition, following the Meeting Iskut Band staff provided Imperial management with a tour of the community outlining existing and needed community services.
	2010-09-16	Byng	Tahltan members	Communitiy Meetings	Dease Lake	As per September 14 th . Approximately six Tahltan were in attendance.	
	2010-10-15	Byng	NWMDRC	Meeting	Smithers	Participation by THREAT	
	2010-10-17	Steve	Arnold	E-mail / letters		Letter confirming business relationship	
	2010-10-17	Byng, Steve, Raj	Norm, TCC and THREAT leadership: Loren Kelly (BC Govt)	E-mails		Discussion of site visit	
	2010-10-28	Byng	NWMDRC	Meeting	Smither	Participation by THREAT	
	2010-11-01	Byng	Annita	E-mail from AM		Requesting Meeting between senior members of TCC and Imperial representatives.	Arrange Meeting for November 15th.
	2010-11-02	Steve, Raj	Bill	Meeting	Imperial Office	Project update	
	2010-11-04	Byng	THREAT, NWMDRC	Meeting and tour	Red Chris mine site	Members flew into Dease Lake and then drove to mine site. Briefing and discussions over lunch before visiting the proposed TIA and proposed site of FHCP. Discussions regarding Archeaology, fish, tailings facility, wildlife.	

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		RCDC	Tahltan				
	2010-11-15	Byng	Annita McPhee, Rob McPhee, Bill Adsit (TNDC), Gary Merkel	Meeting	YWCA, Vancouver	TCC informed Imperial about their intent to further strategic plan by developing project ratification process, method of including more Tahltan in decision-making and Gary Merkel becoming more involved in negotiations, particularly on the NTL. Some discussion about contracting issues.	
	2010-12-06	Byng, Steve, Raj	Bill	Meeting	Vancouver	Discussion re: contracting	
	2010-12-08	Byng	TCC - Annita, Marie	Meeting	Vancouver	Discussion of community communications and ratification plan.	Tahltan communications plan and proposed budget was introduced. Byng Giraud reviewed and indicated Imperial would assist but a Meeting with Brian Kynoch to confirm would be appropriate.
	2010-12-17	Byng, Brian, Robert	TCC - Annita, Rob, Marie	Lunch Meeting	Vancouver	Finalize support for communications and ratification plan.	Discussion regarding communication plan and tools to get more Tahltan involved in decision making. Imperial committed to joining Altgas and BC Hydro in funding the project.
	2011						
	2011-01-25	Steve, Byng, Raj	Bill, TNDC Crew	TNDC Reception	Fairmont Pacific Rim, Vancouver	Reception to celebrate the business activity in Tahltan territory.	
	2011-01-26	Steve, Byng, Raj	Bill, Ed	Meeting	Imperial Office	Review of work in 2010 and discussion about potential work in 2011.	
	2011-03-14	Byng	Nalaine	E-mail		Tahltan seeking a Meeting between Imperial and THREAT	
	2011-03-29	Byng, Raj, Steve	Nalaine, Norm, Jerry, Gerry, Ed, Vera, Remona, Dwayne	Meeting	Hudsons Bay Lodge, Smithers	THREAT Update	
	2011-03-30	Byng, Steve	Feddie, Calvin Carlick	Meeting	Iskut Band Office	Investigating ways that RCDC can support the local community, in all forms.	
	2011-04-20	Byng	Bill	Meeting	Imperial Office	Contracting opportunities	
	2011-05-05	Byng, Steve, Raj	Nalaine, Vera, Norm, Patrick	Meeting	BC Govt offices, Smithers	NWMDRC - Fisheries working group members. Discussion of Fisheries Habitat Compensation Plan for Snapper Creek	
	2011-05-06	Byng, Steve, Raj	Nalaine, Norm	Meeting	BC Govt offices, Smithers	NWMDRC - Wildlife working group members. Discussion of Wildlife Management Plan	
	2011-05-06	Byng, Steve, Raj	Nalaine, Norm, Vera	Meeting	BC Govt offices, Smithers	NWMDRC - Archaeology working group members. Discussion of Archaeology at Red Chris for the summer season	
	2011-06-14	Byng	9 Tahltan outreach staff	Meeting / Tour	Mount Polley Mine, Williams Lake	Visit of Tahltan "trainers" and outreach staff	Information tour and explanation of mining process
	2011-07-06	Byng, Steve, Raj	Bill	Meeting	Imperial Office	Discussion of earthworks contracting	
	2011-08-30	Byng, Steve, Raj	Tahltan members	Tahltan Community Meeting	Best Western, Terrace	Project development	

RED CHRIS MINE DEVELOPMENT / ISKUT EXTENSION TRANSMISSION LINE: CONSULTATION RECORD (2007-2014)

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		RCDC	Tahltan				
	2011-08-31	Byng, Steve, Raj	Tahltan members	Tahltan Community Meeting	Hudson Bay Lodge, Smithers	Project development	
	2011-09-01	Byng, Steve, Raj	Tahltan members	Tahltan Community Meeting	Coast Hotel, Prince George	Project development	
	2011-09-12	Byng, Steve, Raj	Jerry Asp, THREAT	Meeting	Imperial Office	Discussion of Wildlife Management Plan	
	2011-09-13	Byng, Steve, Raj	THREAT representatives	Meeting	BC Govt offices, Smithers	NWMDRC - Archaeology working group members.	
	2011-09-13	Byng, Steve, Raj	THREAT representatives	Meeting	BC Govt offices, Smithers	NWMDRC - Wildlife working group members.	
	2011-09-13	Byng, Steve, Raj	THREAT representatives	Meeting	BC Govt offices, Smithers	NWMDRC - EMA working group members.	
	2011-09-14	Byng, Steve, Raj	Jerry Asp, THREAT	Lunch Meeting	Robs Restaurant, Smithers	Discussion of general issues and wildlife	
	2011-10-06	Byng	Bill	Lunch Meeting	Miyako Restaurant	Project update	
	2011-10-13	Byng, Steve, Raj	Annita, Norm and approximately 35 Tahltan community members	Tahltan Community Meeting	Executive Hotel, Vancouver	Project development	
	2011-10-21	Byng, Steve, Raj	Annita, Norm and approximately 16 Tahltan community members	Tahltan Community Meeting	Quality Inn Northern Grand, Fort St. John	Project development	
	2011-10-26	Byng	Bill	Meeting	Imperial Office	Contracting opportunities	
	2011-10-27	Byng, Steve, Raj	Tahltan representatives	Meeting	Imperial Office	Project development	
	2011-11-01	Byng, Steve, Raj	Annita, Garry, Nalaine, Rob	Meeting (evening)	Imperial Office	Discussion of pre-IBA work, initial preliminary permitting	
	2011-11-04	Byng, Steve, Raj	THREAT representatives, NWMDRC Government representatives	Meeting	Government offices, Vancouver	NWMDRC Water Workshop	
	2011-11-24	Byng, Steve, Raj plus consultants	THREAT representatives, NWMDRC Government representatives	Meeting	AMEC Offices	NWMDRC Water Workshop	
	2011-12-01	Byng	Rob	Meeting	Imperial Office	Project issues	
	2011-12-02	Byng	Rob	Breakfast meeting	Days Inn	Project issues	
	2011-12-05	Byng	Annita	Lunch meeting	Shore Club Restaurant	Project issues	
	2011-12-08	Byng	Annita, Rob	Lunch meeting	Shore Club Restaurant	Project issues	
	2011-12-13	Steve, Byng, Raj	THREAT representatives, NWMDRC Government representatives	Conference call	Vancouver, Dease Lake, Smithers	NWMDRC weekly checklist conference call	
	2011-12-20	Steve, Byng, Raj	THREAT representatives, NWMDRC Government representatives	Conference call	Vancouver, Dease Lake, Smithers	NWMDRC weekly checklist conference call	

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		RCDC	Tahltan				
	2012						
	2012-01-09	Steve, Byng, Raj	Marie	Community Meeting	Iskut	Discuss project as part of community consultation for Mines Act Permitting	
	2012-01-10	Steve, Byng, Raj		Community Meeting	Telegraph Creek	Discuss project as part of community consultation for Mines Act Permitting	
	2012-01-11	Steve, Byng, Raj		Community Meeting	Dease Lake	Discuss project as part of community consultation for Mines Act Permitting	
	2012-01-23	Don, Raj, Byng, Steve		Update/Progress Meeting	Delta Vancouver Suites		
	2012-02-08	Steve, Dave Hatler	Norm, Dwayne	Wildlife Meeting	Bat Cave, FLNRO office in Smithers	Finalize the Red Chris Wildlife Management Plan	
	2012-02-14	Steve, Byng, Raj	Norm	FLNRO Meeting to discuss MA Permitting	FLNRO office in Smithers		
	2012-03-12	Byng	Annita, Rob	E-mail		described; 1) creation of a company to build line and use Tahltan contractors to build 2) asking Tahltan to select dates for MMER 3) approval of contract work with Castlemain 4) invitation to attend political fundraiser	
	2012-03-28	Steve, Byng, Raj	Annita, Norm	Community Meeting	Whitehorse	Discuss project as part of community consultation for Mines Act Permitting	
	2012-05-12	Kevin McKenzie, Alex Robertson	Feddie	Job Fair	Dease Lake Elementary School	Had a booth and major supporter for Job Fair	
	2012-08-29	Steve, Raj, Byng, Jack	Norm, Nalaine, Dwayne, Patrick,	Kick-off Meeting for 3rd party review	Robertson Geoconsultants	Kick-off Meeting for 3rd Party Review of Hydrogeology model at Red Chris	
	2012-09-10	Jack, Alex, Brian, Byng, Don, Raj, Steve, Tim	Dwayne, Nalaine, Norm, Patrick	RCMC Meeting TOR Discussion	III Boardroom	Discuss how the RCMC will work at a Higher Level RCMC Board and a RCMC Technical Subcommittee (Water and Wildlife Advisory Committee(WWAC))	
	2012-09-21	Byng	Annita	Meeting	III Boardroom	Update Meeting	
	2012-09-28	Steve, Raj, Byng	Norm, Patrick, Vera	RCMC Meeting #3	FLNRO office in Smithers and teleconference	review TOR, archaeology, project update	
	2012-10-22	Steve, Jack	Norm, Dwayne	Wildlife Working Group Meeting	Conference call	update on wildlife work and plans	
	2012-10-31	Steve, Jack, Byng, Raj	Norm,	RCMC Meeting #4	Conf call		
	2012-11-15	Steve, Byng	Maire, Feddie	E-mail		E-mail from Marie expressing concern that wood was being burned on site. Steve responded by arranging for deliveries from site to the community. Over 10 logging truck loads were delivered.	
	2013						

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		RCDC	Tahltan				
	2013-02-25	Jack, Raj, Don, Bryan Alexander, Steve, Byng	Patrick, Nalaine, Norm, Dwayne,	RCMC Meeting	Red Chris Site	Site tour	
	2013-04-05	Steve	Rob, Rob Miller	Meeting	Imperial Office	IBA Term Sheet discussion	
	2013-04-08	Steve	Annita	Phone call	Vancouver	Discuss IBA Progress	
	2013-04-17	Steve, Don, Denis, Raj	Bill	Meeting	Imperial Office	Discuss progress on Mine	
	2013-04-19	Ben, Pierre, Steve	Rob, Rob Miller	Meeting	Imperial Office	Discuss the schedule for meeting to push IBA discussions forward	
	2013-04-19	Steve	Nalaine	Meeting	Imperial Office	Environment Section of IBA Term Sheet	
	2013-04-20	Jack, Casey Cawston, Jordon Muldoe	Feddie	Tahltan Job Fair	Dease Lake Elementary School	Had a booth and major supporter for Job Fair	
	2013-04-30	Steve Don, Denis, Raj	Bill	Meeting	Imperial Office	update on contracting opportunities	
	2013-05-06	Steve	Annita	E-mail		RCDC query as to Tahltan thinking in regard to the consultation plan and proposal that had been presented.	
	2013-05-10	Steve, Pierre, Ben	Rick, Annita, Marie, Nalaine, Rob, Rob Miller	Meeting	Imperial Office	IBA Term Sheet and transmission line progress discussion	
	2013-05-13	Steve	Rob	E-mail		note of thanks for IBA discussion and reaffirmation of Imperials commitment to forging a atmosphere of partnership between the mine and the community. Also reported that Pierre is actively pursuing the concept of establishment of an RCMP detachment in Iskut.	
	2013-05-22	Steve, Ben, Pierre	Rob, Rob Miller, Nalaine, Marie, Annita	Meeting	Imperial Office	IBA Term Sheet discussion	
	2013-05-24	Pierre	Annita	Letter		Letter thanking Tahltan for IBA discussions and making several points for consideration 1) Strong alignment that we need a profitable and sustainable mine 2) strong alignment on environmental protection, tahltan education and training 3) commitment to invest in communities 4) commitment to support human resource committees 5) the financial royalty must remain based on 2006 Term sheet terms.	
	2013-05-27	Steve	Norm, Patrick	RCMC Meeting	Smithers		
	2013-06-05	Steve	Annita, Rob, Rob Miller	E-mail		Sent new version of Term Sheet	
	2013-06-07	Steve	Rob	email		photos of construction progress to support Tahltan leadership discussions in advance of AGM	
	2013-06-14	Steve, Pierre, Ben	Annita, Rob, Rob Miller, Nalaine	Meeting	Imperial Office	IBA Term Sheet discussion	
	2013-06-27	Steve, Ben, Doug, Tim	Rob, Rob Miller	Meeting	Imperial Office (5th Floor)	Discuss Jobs and Contracting for IBA	
	2013-06-27	Steve, Pierre, Ben	Rob, Rob Miller	Meeting	Imperial Office	Discuss Financial Terms of IBA	

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	2013-06-28	Steve	Bill	Meeting	Imperial Office	Project update.	
	2013-07-04	Steve, Jack	Nalaine, Norm	Conference call		Discuss Community Meetings for Transmission Line	
	2013-07-08	Steve, Jack	Nalaine	Meeting	Imperial Office	discuss EPC section of the IBA	
	2013-08-01	Steve	Rob	Lunch Meeting	The Mill	Discuss IBA and H37P Progress	
	2013-08-07	Steve, Jack	Nalaine, Norm	Teleconference		RCMC Meeting	
	2013-08-16	Steve, Jack	Nalaine, Norm	Meeting	Imperial Office	Discuss Environmental matters related to IBA	
	2013-08-22	Steve	Rob	Meeting	Imperial Office	discuss IBA progress	
	2013-08-29	Steve	Rob	Meeting	Imperial Office	discuss progress on IBA	
	2013-08-29	Steve, Don, Denis, Doug	Bill	Meeting	Imperial Office	update on contracting opportunities	
	2013-09-12	Jack	Marie, Norm	E-mail		Request for community Meeting from Chief Marie	
	2013-09-12	Jack, Steve	Marie, Norm	E-mail		Follow up to above.	
	2013-09-12	Steve	Marie	phone call		Discussed need to have a community meeting. Steve asked Marie if we could have meeting as soon as possible. She was very receptive and helpful and a meeting was scheduled for the following week.	
	2013-09-12	Steve, Jack, Blaine	Marie, Norm	E-mail		E-mail followup from phone conversation confirming meeting and describing details for catering and advertising.	
	2013-09-12	Steve, Jack, Blaine	Marie, Norm			Response E-mail from Marie indicating to contact Treena Quock for logistics	
	2013-09-16	Steve	Rob	Phone call		IBA	
	2013-09-17	Steve	Marie, Annita, Rick, Rob, Freddie	E-mail		E-mail to notify Talhtan that Imperial has found an ex-RCMP officer that is well qualified to assess the ability for Iskut to get a policing solution.	
	2013-09-20	Steve, Denis, Doug	Bill, Garry	Meeting	Imperial Office	minesite and H37P issues discussed	
	2013-09-24	Steve	Marie	Phone call		Call to discuss having Curt Tugnum visit Iskut to meet with community leaders, tour the community and discuss a policing solution.	
	2013-09-23	Steve, Tim, Don, Ben	Rob, Rob Miller	Meeting	Imperial Office	Walk through contracting section of IBA	
	2013-09-25	Steve	Annita, Norm, Rick, Nalaine, Marie	E-mail		Invitation for Tahltan leadership to tour minesite and related infrastructure during upcoming MMER Meetings	
	2013-09-25	Steve, Nicole Melanson, Tim	Annita, Rick, Norm, Nalaine, Marie	emial		Invitation from Imperial to host a tour of Red Chris for Tahltan leadership, MMER staff, DFO and provincial government representatives on Oct 2.	
	2013-09-27	Steve	Marie	emial		confirmation from Marie that iskut is very interested in pursuing the concept of our consultant doing work towards a policing solution.	
	2013-09-30	Steve, Gord	Norm, Rick	Community Meeting for MMER	Telegraph Creek		

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	2013-10-01	Steve, Gord	Norm, Nalaine	Community Meeting for MMER	Dease Lake		
	2013-10-02	Steve, Jack, Gord	Rick, Annita, Marie, Nalaine, Norm	Site Tour of Red Chris	Red Chris	Viewed north end of Transmission Line clearing and toured Construction at Mine site	
	2013-10-02	Steve, Jack, Gord	Norm, Nalaine, Marie	community Meeting for mmer	Iskut		
	2013-10-03	Steve, Jack, Gord	Norm, Patrick	Community Meeting for MMER	Smithers		
	2013-10-10	Steve, Gord	Norm, Nalaine (by phone)	Community Meeting for MMER	Ottawa		
	2013-10-16	Steve, Doug, Denis, Don	Bill	Meeting	Imperial Office	H37P / Minesite matters	
	2013-10-17	Steve	Marie	E-mail		Provide a summary of MMER Meeting in Ottawa. Also discuss the plan to provide Iskut members access to firewood outside of the mine gate.	
	2013-10-29	Pierre, Ben, Steve	Rob, Rob Miller	Meeting	Imperial Office	Terms sheet discussion	
	2013-10-31	Steve, Jack,	Norm, Nalaine, Patrick	Meeting	FLNRO office in Smithers	Discuss the application for an EMA permit for operations	
	2013-12-18	Steve, Pierre, Ben, Tim	Annita, Nalaine, Rob, Rob Miller	Meeting	Imperial Office	Terms sheet discussion	
	2013-12-19	Steve, Sabine	Annita, Ramona	E-mail	E-mail from Imperial	Confirmation that Imperial will sponsor 8 Tahltan including 5 from leadership and 3 youth to attend AMEBC Mineral Exploration Roundup in January 2014. Imperial will pay for registration and put them up in a hotel.	
	2013-12-24	Ben	Rob, Rob Miller	email	email from Imperial	sent latest revisions to the proposed Term Sheet for IBA. Tahltan requested short turn around to facilitate their board schedule. Meeting Jan 7 - 8	
	2014						
	2014-01-03	Steve	Rob	phone call		Call to discuss next meeting on IBA. Board meeting may be delayed, but should meet on Monday to discuss IBA anyhow.	
	2014-01-06	Steve, Ben, Pierre	Rob, Rob Miller, Annita	Meeting	Imperial office	Found out at 11 AM that Rob Miller was out of town and unavaialble, and response to Term Sheet was not completed. 1 PM meeting was cancelled.	
	2014-01-08	Steve	Ramona	Phone call	Call from Tahltan	Asking further details on sponsorship of Tahltan to attend Roundup. Imperial offered to register 8 Tahltan, including President and 2 Chiefs, 2 councilors and 3 youth. Also picked up hotel for 7 of the 8 and travel for the youth	

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	2014-01-09	Jack, Dan Emmerson, Dan Kennedy	Norm, Patrick	Hydrogeological Working Group	Red Chris Site	Tour and two nights in camp to review progress on the hydrogeology program. Included a teleconference in the afternoon, where Nalaine, Steve, Diane and Jeaniene called in	
	2014-01-13	Ben	Rob, Rob Miller	email		Imperial sent a memo outlining our position on the outstanding issues related to the IBA Term Sheet	
	2014-01-21	Steve	Ramona	Phone call		Ramona called to discuss that TCC could not source one youth from each community so Steve approved having two attend from Dease Lake in addition to the one from Iskut.	
	2014-01-22	Steve	Rob	E-mail		Tahltan have proposed a support letter for Tahltan to send to government, supporting the concept of government guaranteeing the reclamation work be awarded to Tahltan in the event that Imperial defaults and cannot perform.	
	2014-01-24	Steve, Ben, Tim	Rob, Rob Miller, Nalaine	Meeting	Imperial office	Ben, Steve and Rob Miller in office, McPhee and Nalaine on the phone. Discussed few remaining issues on IBA.	McPhee reported that the TCC board has approved Term Sheet, subject to the last few remaining items to be settled to the satisfaction of the TCC Executive.
	2014-01-27	Steve, Don, Jack	TNDC representatives	Dinner	Fairmont Waterfront Hotel, Vancouver	Dinner meeting	
	2014-01-29	Steve	Annita, Rob, Marie, 3 Tahltan youth	Lunch meeting	The Mill	Informal meeting to build relations	
	2014-01-29	Steve	Annita, 3 Tahltan youth	Meeting	Imperial office	After lunch, Annita and 3 youth returned to Imperial Office where Steve gave a presentation on Red Chris and a second presentation on Career opportunities in the mining business.	
	2014-02-12	Steve	Bill	Meeting	Imperial office	Meet to discuss upcoming and ongoing business opportunities.	
	2014-02-13	Steve	Peter Jakesta	Phone call		Called to confirm our sponsorship of hockey jerseys for the upcoming tournament.	
	2014-02-28	Steve	Rob's Miller and McPhee	Meeting	Imperial Office	Meet to discuss terms of IBA	Significant progress made on many issues. Terms sheet getting close.
	2014-03-12	Steve	Nalaine, Norm, Patrick	Conference call		Some of RCMC on site, but Steve called in. Most of discussion around the hydrogeology program	Good consensus that program is going well and planned holes were changed to accommodate request by Tahltan
	2014-03-14	Steve	Rob McPhee	Phone Call		Discussed the state of Labour Market work and IBA in light of the upcoming Spring Break and that everyone would be taking some time off.	All seems to be progressing well.
	2014-03-25	Steve, Doug	Rob, Annita, Rick, and about 30 others in attendance	Meeting	Northwest Community College terrace campus	Attended Labour Market meeting at the request of Tahltan.	

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	2014-03-26	Steve, Doug	Rob	email		email from Rob thanking RCDC for attending the March 25 meeting.	
	2014-04-01	Steve	Rob	email		emailed the Red Chris mine operational manpower projections to Rob	
	2014-04-01	Steve	Rob	email		proposed itinerary for the mid April - early May series of community meetings.	
	2014-04-01	Steve, Gord	Rob, Rob, Nalaine	Meeting	Castlemain Office	Discuss upcoming community meetings to support IBA discussion	
	2014-04-01	Steve, Gord	Rob, Rob, Nalaine	Lunch	Marriott Hotel	Lunch with the group to discuss business between us in general	
	2014-04-10	Steve	Bill	phone call		Discuss work on Transmission line and at the minesite.	
	2014-04-11	Steve, Dan Henshaw	Rob	Meeting	III Boardroom	Meet to discuss the upcoming consultation meetings and the use of our photographer to photograph the meetings.	
	2014-04-11	Steve	Rob, Richard Truman	email		Email from Rob indicating Marie would not make it to the Prince George meeting as she was attending a funeral	
	2014-04-12	Doug, two others	Feddie	Job Fair	Dease Lake	Booth and major supporter for Tahltan Job Fair in Dease Lake	
	2014-04-12	Steve, Gord	Annita, Rick, Nalaine, Rob, Rob	Community Meeting	Prince George, Sandman suites	About 35 members in attendance. Most concerns about getting work at the mine. Attendance was slow to build but a full house by the end of the meeting.	
	2014-04-12	Steve, Gord	Annita, Rick, Nalaine, Rob, Rob	Community Meeting	Ft St John, Sandman suites	About 25 in attendance, with a similar theme to the Prince George meeting.	
	2014-04-13	Steve, Gord	Annita, Nalaine, Rob, Rob	Community Meeting	Telegraph Creek, Community Centre	About 30 in attendance. This meeting was dominated by three members with strong opposition to development. Most of the comments were directed at the leadership not the company. Meeting went on for 6 hours.	
	2014-04-14	Steve, Gord	Annita, Nalaine, Rob, Rob	Community Meeting	Dease Lake, School Board Office	Only 4 or 5 people wandered in and out and not for a long time. Not much feedback from the community.	
	2014-04-15	Steve, Gord	Annita, Nalaine, Rob, Rob	Community Meeting	Red Chris mine site	About 30 Tahltan employees and contractors in attendance. A lot of concern expressed that the mine would be run by employees and those that had worked for TNDC couldn't continue to work there under that arrangement.	
	2014-04-15	Steve, Gord	Annita, Nalaine, Rob, Rob, Marie	Community Meeting	Iskut, Community Centre	About 30 in attendance. The meeting was very quiet compared to previous meetings that we have held in Iskut. A lot of discussion about power coming to Iskut and the desire to have the generators left in place.	

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	2014-04-16	Steve, Gord	Annita, Nalaine, Rob, Rob	Community Meeting	Whitehorse, Cultural Centre	About 25 in attendance. Some good questions from the community about how to get work, how Imperial operates as a company and the longevity of the mine.	
	2014-04-28	Steve, Gord	Annita, Nalaine, Rob, Rob, Rick	Community Meeting	Smithers, Hudsons Bay Lodge	About 40 in attendance. Good productive discussion. Jerry Creyke in attendance and expressed concerns about the project, but overall a very positive meeting	Steve reviewed the measures that have been taken to accommodate the Creyke family including timing of work, moving the transmission line and providing fence posts. Also noted that most of the family is working on the project.
	2014-04-29	Steve	Rob	email		email to Rob was a response to a question from Ann Ball last night in Smithers. Who can we direct email queries for employment to in the meantime before the IBA is signed and the Tahltan HR positoin is filled.	Rob responded by phone and said to send them to him.
	2014-04-29	Steve, Gord	Annita, Nalaine, Rob, Rob, Rick	Community Meeting	Terrace, Best Western	About 40 in attendance. Imperial presentation went without interruption, but just as Steve and Gord were leaving, one family got up to express a bunch of random concerns, most of which had nothing to do with the project. Tahltan leadership were really given a tough time and the meeting went on for about 4.5 hours.	
	2014-04-30	Steve, Gord	Annita, Nalaine, Rob, Rob, Rick	Community Meeting	Prince Rupert, Crest Inn	Smaller meeting with only 20 or so, but a very positive and upbeat meeting. Lots of thoughtful questions about how to get work and how long mine will last.	
	2014-05-01	Steve, Gord, Tim, Doug	Annita, Nalaine, Rob, Rob	Community Meeting	Burnaby	About 35 in attendance. Again a lot of questions about contracts and employment and the process for Tahltan contractor preference.	
	2014-05-02	Steve	Annita, Rick, Marie, Nalaine, Rob, Rob	email		Note of thanks to the group for their hard work which resulted in a very sucessful round of community meetings with good turnout. Also a note of condolence for those that had recently lost loved ones.	Many replys of thanks and agreement on the success of the community meetings.
	2014-05-13	Ben	Rob	email		Ben forwarded Steve's email of January 29th to Rob and Rob, which suggested pay rates for two positions defined in the Term Sheet: the PEC and Tahltan HR employees.	
	2014-05-14	Curt Tugnum	Feddie	Meeting	Vancouver	Socio-Cultural Working Group meeting. We sent Curt as a company representative to advise Tahltan on matters relating to policing. This support will be ongoing. We also supported Tahltan in their quest for funding on this committee, which received half a million dollars from the provincial government.	

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	2014-05-14	Steve	Annita, Rob	email		provided an update on the employment situation on the project. It was in response to complaints that there is not enough Tahltan employment (yesterdays meeting with Bill and a followup phone call by Annita).	The details regarding current jobs revealed that most jobs are skilled trades which cannot be readily filled from the local workforce.
	2014-05-22	Ben, Steve	Rob, Rob, Annita	email		Rob Miller sent a note stating that Annita would attend the afternoon meeting. It was originally intended to be an IBA discussion but turned into a meeting about jobs and contracting on the project.	
	2014-05-22	Steve	Annita, Rob Miller	Meeting	Imperial Office	Annita came in to express concerns about getting more work for TNDC. We noted that the construction work is slowing down and that it will be a while before the reclamation/clean-up activity will ramp up. Also complained about our general foreman, claiming that he is unfair to Tahltan employees. Want RCDC to consider funding Tahltan Employment Coordinator position starting in mid June. Also asked about second chance policy.	Explained the "ramp-down" of work on the transmission line again. Reiterated our position on GF. He is a hard driver and is unpopular with many of his crew, native and non-native, but he gets high production and ultimately respect. We suggest that the TEC position is ok to start early, but warn that if the IBA doesn't get signed, there will be no funding. Second chance will be the same for all employees.
	2014-05-26	Steve, Doug, Jack	Denise Williams, Naliane, Rob, Richard Truman, Rob Miller	emails		Many emails exchanged with information to help Tahltan create a brochure on Red Chris project as a result of questions raised during the recent round of community meetings.	
	2014-05-29	Steve, Denis	Bill	Meeting	Imperial Office	Discuss potential for future work for TNDC at the Project.	
	2014-06-06	Doug, Steve	Rob	email		Doug emailed Rob to provide the postings for equipment operators and electricians.	
	2014-06-06	Steve	Annita	email		Annita forwarded resume of Ernest Quash (equipment operator) asking for work at Red Chris	Steve forwarded on to Doug McFee for further consideration
	2014-06-10	Steve, Don, Denis,	Bill, Garry	Meeting	Imperial Metals	Bill announced that he has formed an alliance with Lake Excavating. Hoping that this relationship will work in TNDC favour for work on the dam raise this year. Also that TNDC has done an equipment deal with Highland for 25 kV distribution. Reprots that TNDC ops mgr Hankin tells him that working with our mining super (Nehring) is working out really well. Inquired about need for TNDC to work on Transmission line reclaim - we discussed timing is not right yet.	
	2014-06-10	Steve, Gord	Annita, Marie, Rick	email		Annita requested a site visit at Red Chris the following week to discuss concerns being raised by employees.	Steve responded that due to scheduling conflict there would unfortunately be no appropriate mgmt on site. Suggested that we could arrange for another time.

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	2014-06-12	Ben, Steve, Sophie, Tim	Rob, Rob	email		Sent to Tahltan for review the first attempt of conversion of the agreed upon Term Sheet into an IBA.	
	2014-06-12	steve	rob	lunch	Lions Pub	discussed status of IBA, leadership campaign and labour force project.	
	2014-06-16	steve	Annita, Tracey Woods	email		email from Annita introducing steve to Tracey who is requesting a donation for Grad ceremony. Annita mentioned Imperial Metals generous support from previous years.	
	2014-06-18	Steve	Rob	email		Request to Rob to provide a time to meet the following week to discuss IBA.	After a few email, it was decided to meet on Tuesday June 24.
	2014-06-18	Steve	Rob	email		email to note that steve would like to discuss the details for the potentially upcoming IBA signing at our meeting Tuesday. Also asked if Annita could attend.	
	2014-06-19	Steve	Tamara Dennis, Ramona Quock, Annita	email		confirmation that RCDC would consider about \$5000 donation to the music fest for the stage. Asked for a more permanent acknowledgement of our donation	
	2014-06-23	Steve	Rob Miller	email		Notice that Annita would like to cancel the meeting she requested on June 23 and proposed an agend for meeting on June 24.	
	2014-06-24	Steve, Sophie, Ben	Rob, Rob, Annita, Rick by phone	meeting	Imperial Office	discussed 1) IBA - received draft but not ready to comment. 2) Blueberry patch - community upset so we made a plan to dispell misinformation 3)Contracting on Transmission line - explained the construction work is winding down and reclamation work will be a small project and will take a while to get ramped up	Produced some messaging pieces for THREAT to have related to BBP during the AGA. Products included a large poster map of the blueberry patch, a reclamation memo on the BBP and verbal talking notes on contracting history on the H37P TL.
	2014-06-30	Steve	Rob	phone call		went over the matters for discussion at the AGA once again. Rob noted that they had everything that they had been looking for in regard to supportive information	
	2014-07-07	Steve	Bill	meeting	Imperial Office	bill picked up a cheque for TNDC for work on TIA at red chris	
	2014-07-10	Steve, Jack, Dave Hatler	Norm,	phone call		Wildlife Monitoring Advisory Committee Conference Call. Discussed the ongoing, site wide wildlife program.	
	2014-07-15	steve, Pierre	Annita	Lunch	Mosaic Grill	Discussion about the election, past achievements and predictions about future needs of community.	
	2014-07-17	steve	Bill	Meeting	III Boardroom	Bill brought in new partner Lake Excavating to discuss contracting opportunities.	
	2014-07-21	steve	Terri	Phone call		Steve phoned newly elected Chief Terri Brown to discuss Red Chris and invite her to tour the mine at anytime of her convenience.	Terri suggests late August as a good time for a tour.

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		RCDC	Tahltan				
	2014-07-21	Steve	Rob	Phone call		Rob called to discuss incoming president Chad Day and how Tahltan would like to integrate him immediately into many activities including IBA discussions	
	2014-07-24	steve	bill	meeting	III Boardroom	Bill came in to discuss contracting opportunities.	arranged phone call for following day.
	2014-07-25	steve	bill	Phone call		steve called bill to discuss dam raise on North Started Dam and to discuss crew flights to dease lake.	
	2014-08-18	steve, Pierre, Brian, Sophie	Chad, Rob, Nalaine	Meeting	III Boardroom	Debrief on Mount Polley dam breach	
	2014-08-27	steve	rob	Phone call		call to discuss the aftermath of roadblock and how to set path forward.	
	2014-09-02	steve, Pierre, Brian, Sophie	rob, rob miller	meeting	III Boardroom	Further discussion on aftermath of roadblock, and discussion on path forward, including implication for discussion on IBA	
	2014-09-19	steve, pierre, ben	Chad, Rob, Rob miller, nalaine.	meeting	III Boardroom	further negotiation on IBA	
	2014-09-23	steve, pierre, ben	chad, rob, Rob miller	meeting	III Boardroom	further negotiation on IBA	
	2014-10-06	steve, denis	bill	meeting	III 5th floor	bill in to discuss Tahltan response to second blockade. Report that leadership supports the mine and does not support the blockade.	
	2014-10-08	steve, ben	Rob, rob miller, nalaine, Chad	meeting	III Boardroom	IBA discussion	
	2014-10-09	brian, raj, steve, tim, don, pierre	Chad, Marie, Rob, Nalaine, Norm, Patrick,	meeting	1111 W Hastings, 15th Floor	Review the completed KCB Third Party Review	Imperial Metals agreed to adopt all recommendations from the report
	2014-10-14	brian, steve	Chad, Rob, Rob Miller	meeting	Blockade at Red Chris	Negotiated a new agreement with Tahltan to ensure the 2nd blockade came down and would not be resurrected.	A new agreement, the "Tailings Agreement" was struck to ensure the blockade was ended.
	2014-10-18	steve	Rhoda Quock	Phone call		invited Klabona Keepers to Red Chris for a tour	Invitation declined
	2014-10-20		Rob, Rob Miller, Nalaine	Community Meeting	Dease Lake	Company sponsored Tahltan Leadership to go on a tour of communities to discuss IBA and update on Mount Polley	
	2014-10-21		Rob, Rob Miller, Nalaine	Community Meeting	Smithers	as above	
	2014-10-22		Rob, Rob Miller, Nalaine	Community Meeting	Terrace	as above	
	2014-10-24		Rob, Rob Miller, Nalaine	Community Meeting	Burnaby	as above	
	2014-10-27		Rob, Rob Miller, Nalaine	Community Meeting	Watson Lake	as above	
	2014-10-28		Rob, Rob Miller, Nalaine	Community Meeting	Whitehorse	as above	
	2014-10-29		Rob, Rob Miller, Nalaine	Community Meeting	Fort St John	as above	
	2014-10-30		Rob, Rob Miller, Nalaine	Community Meeting	Prrince George	as above	
	2014-11-02		Rob, Rob Miller, Nalaine	Community Meeting	Edmonton	as above	

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		RCDC	Tahltan				
	2014-11-12	steve, pierre, ben	rob, rob miller, chad,	meeting	III Boardroom	review latest round of community meetings, status of 3rd party review, iba discussions with BC Hydro, update on ECDA with Prov, Tax implications of IBCA, NSR, dispute resolution, discrimination, contracting language and project definition	
	2014-11-19	steve	rob	lunch	Mosaic Grill	general update	
	2014-12-02	steve, Brian	rob, nalaine	meeting	III Boardroom	discussed Red Chris EMA Permit	
	2014-12-04	steve, brian, pierre, tim, raj	chad, heather hawkins, nalaine, marie, terri, rob, patick	meeting	III Boardroom	develop work plan for Red Chris 3rd party tailings review	
	2014-12-11	steve	nalaine	phone call		discuss permitting for red chris	
	2014-12-15	steve, ben	rob, rob miller, chad, nalaine	meeting	III Boardroom	Red chris iba discussion.	
	2014-12-16	steve	rob	phone call		follow up on IBA discussion the previous day	
	2015						
	2015-01-07	steve	chad	lunch	Mosaic Grill	catch up on all matters related to Red Chris	
	2015-01-29	steve	bill, Garry	Reception	Fairmont Waterfront Hotel, Vancouver	Reception to celebrate the business activity in Tahltan territory.	
	2015-02-02	steve, brian, raj	Chad, Rob, Nalaine	meeting	III 5th floor	Brought in Terry Eldridge to go over results of the Mt Polley panel report	
	2015-02-11	steve, raj, tim, eamon mauer, tim nehrling, brian, gord	Nalaine, Richard Truman	meeting	III 5th floor	brought in Iain Bruce, daryl dufault and todd martin to describe comparison of Mt Polley and Red Chris Dams.	
	2015-02-17	steve, gord, daryl dufault	rob, rob miller, nalaine, Chad	Community Meeting	Dease Lake	presentation of update on Red Chris mine, discussion of Mount Polley and update on IBA	
	2015-02-18	steve, gord, daryl dufault	rob, rob miller, nalaine, Marie, Chad	Community Meeting	Telegraph Creek	presentation of update on Red Chris mine, discussion of Mount Polley and update on IBA	
	2015-02-19	steve, gord, daryl dufault	rob, rob miller, nalaine, Chad	Mine Tour	Red Chris Mine site	Tour of Red Chris mine only two days after the first date of concentrate production	
	2015-02-19	steve, gord, daryl dufault	rob, rob miller, nalaine, Chad	Community Meeting	Iskut	presentation of update on Red Chris mine, discussion of Mount Polley and update on IBA	
	2015-02-20	steve, gord, daryl dufault	rob, rob miller, nalaine, Chad	Community Meeting	Watson Lake	presentation of update on Red Chris mine, discussion of Mount Polley and update on IBA	
	2015-02-21	steve, gord, daryl dufault	rob, rob miller, nalaine, Chad	Community Meeting	Whitehorse	presentation of update on Red Chris mine, discussion of Mount Polley and update on IBA	
	2015-02-21	steve, gord, daryl dufault	rob, rob miller, nalaine, Chad	Community Meeting	Terrace	presentation of update on Red Chris mine, discussion of Mount Polley and update on IBA	
	2015-02-22	steve, gord, daryl dufault	rob, rob miller, nalaine, Chad	Community Meeting	Smithers	presentation of update on Red Chris mine, discussion of Mount Polley and update on IBA	
	2015-02-22	steve, gord, daryl dufault	rob, rob miller, nalaine, Chad	Community Meeting	Prince George	presentation of update on Red Chris mine, discussion of Mount Polley and update on IBA	
	2015-02-23	steve, gord, daryl dufault	rob, rob miller, nalaine, Chad	Community Meeting	Fort St John	presentation of update on Red Chris mine, discussion of Mount Polley and update on IBA	

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		RCDC	Tahltan				
	2015-02-24	steve, gord, daryl dufault	rob, rob miller, nalaine, Chad	Community Meeting	Vancouver	presentation of update on Red Chris mine, discussion of Mount Polley and update on IBA	
	2015-04-14	Steve, raj, tim, jack	nalaine	meeting	III 5th floor	Discuss Red Chris water Chemistry results	Discuss selenium levels in the Red Chris TIA and Steve Day's best estimate of potential causes. Path forward to test theories is also put forward.
	2015-04-14	steve	rob	lunch	Mosaic Grill	discuss latest developments on IBCA discussion.	
	2015-04-16		tahltan community	community referendum	all tahltan communities	Community votes on acceptance of the proposed IBCA vote runs April 16 - 18.	Community votes 87% in favour
	2015-04-20	steve	chad, rob	lunch	Mosaic Grill	discuss next steps to finalize IBCA	
	2015-05-01	steve	rob	meeting	III Boardroom	discuss community rumours regarding red chris mine	several phone calls to community leadership and the mine to quell rumours.
	2015-05-04	steve	chad, rob	Breakfast meeting	Fairmont Waterfront Hotel, Vancouver	met with Alaska Lt Gov Byron Mallott to discuss transboundary mining issues and first nations interests.	took Lt Gov for a tour of Mount Polley and invited him to come to Red Chris
	2015-05-11	steve, gord, daryl dufault	rob, rob miller, nalaine, Chad	Community Meeting	Iskut	presentation of update on Red Chris mine, discussion of Mount Polley and update on IBA	
	2015-05-12	steve, gord, daryl dufault	rob, rob miller, nalaine, Marie, Chad	Community Meeting	Telegraph Creek	presentation of update on Red Chris mine, discussion of Mount Polley and update on IBA	
	2015-05-20	steve	rob	meeting	III Boardroom	work on finalizing IBCA language	
	2015-06-02	steve, raj, jack, tim	nalaine	meeting	III 5th floor	meeting with government and consultants to discuss draft ema permit and draft monitoring program for red chris	
	2015-06-08	steve, brian, tim, jack, raj, don	nalaine	Red Chris IERP Meeting	BGC Office	kick off meeting of the newly formed IERP	
	2015-07-08	steve	rob	Lunch meeting	Mosaic Grill	discuss IBCA signing	
	2015-07-16	steve, denis, don	bill, ryan frank	meeting	III 5th floor	discuss ongoing work at Red Chris as well as other business opportunities	
	2015-07-27	brian, pierre	Chad, Marie, Terri, Rob, Heather,	IBCA Signing	III Boardroom	Signing of Final version of IBCA	First milestone payment made
	2015-09-02	steve, denis	ryan franke	meeting	III 5th floor	discuss ongoing work at Red Chris as well as other business opportunities	
	2015-09-15	steve	chad	Lunch meeting	Mosaic Grill	discuss MMER issues and Red Chris operation	
	2015-09-16	steve	rob	meeting	III Boardroom	start to map out plan to establish PAC and implement IBCA	
	2015-10-18	mine site personnel	tahltan employees at Red Chris	celebration of Tahltan Day	Red Chris Mine site	Celebration of first "Tahltan Day" at Red Chris mine	
	2015-10-26	steve	nalaine	Lunch meeting	Mosaic Grill	discuss permitting for Red Chris South Dam	
	2015-11-03	raj, tim, don, Brian, Steve, Tim Nehring, Eamon Mauer, Jack	Nalaine	IERP Meeting No. 2	BGC Office	2nd meeting of IERP	nalaine brought questions from community that will be considered and answered in report
	2015-11-09	steve	rob	phone call		called Rob to discuss setting up PAC	Pac meeting set for Nov 18

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		RCDC	Tahltan				
	2015-11-16	steve	norm	phone call		called to discuss who will be handling permitting on Tahltan side for South Dam	Until further notice, norm is the main contact
	2015-11-17	steve, tim, denis, doug	garry, Ryan Franke	phone call		call to discuss issues with operation of the air service for mine personnel.	
	2015-11-18	steve, tim, doug	Rob, adrian, calvin	1st PAC meeting	III Boardroom	discussed TOR and work plan for PAC	
	2015-11-19	steve, don, raj, jack	patrick,	phone call		discuss the upcoming permitting process for Red Chris south dam	
	2015-12-03	steve, jack, raj, don	nalaine, norm, patrick	meeting	III Boardroom	discuss the upcoming permitting process for Red Chris south dam	
	2015-12-07	steve	nalaine	Phone call		discuss the upcoming permitting process for Red Chris south dam	
	2016						
	2016-01-05	steve, pierre	Chad, Adrian	meeting	III Boardroom	Discuss communications between mine and local community to avoid rumour mongering and false gossip about what goes on "up the hill"	Implement a plan for Adrian and minesite personnel to engage more often and more effectively to ensure the best information is getting into the community.
	2016-01-11	steve, jack, raj, don	Nalaine, Patrick, Rob	Pre-MRC Meeting	Raven Room, Smithers government office	Meet to discuss the application information requirements for the South Dam.	
	2016-01-13	steve	rob	Lunch meeting	Marriott Hotel	discuss the IBCA implementation and permitting process	
	2016-01-15	steve	nalaine	phone call		discuss south dam permitting and MMER process.	Request a meeting with Minister McKenna's office to discuss Red Chris MMER. Message not responded to.
	2016-01-19	steve	nalaine	meeting	III Meeting room	Discuss consultation plan for south dam permitting	steve forwarded consultation plan, as proposed by Tahltan, to Province.
	2016-01-22	steve, raj, jack	nalaine, patrick, rob	Pre-MRC meeting	Ptarmagin room, Smithers govt office	Discuss the draft joint application information requirements for the Mines Act and Environmental Management Act – effluent discharge permit amendments for South dam proposal.	
	2016-01-25	steve, Don, Denis	Garry, Hankin	meeting	5th floor	discuss business opportunities, particularly related to TIA work in 2016.	
	2016-01-25	Steve	Chad, Rob, Hankin, Garry, Bill, Heather, Marie	TNDC Open House	Farimont Waterfront	Celebration of business achievements of TNDC in Tahltan Territory.	
	2016-01-27	steve, Tim, Doug	Rob, adrian, calvin	PAC Meeting	III Boardroom	Set up subcommittees and provide a mandate. Also met with leadership to hear feedback from community as well as provide information on the operation at Red Chris and how PAC and subcommittees will operate in the coming year.	
	2016-02-02	steve	nalaine	phone call		discuss MMER issues and Red Chris south dam permitting	

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		RCDC	Tahltan				
	2016-02-10	steve, jack, raj	Nalaine, Patrick, Rob	Pre-MRC meeting	BGC Office	Discuss south dam TOC and Water Balance/ Water Quality Model	
	2016-02-10	steve	Nalaine, Patrick, Rob	Meeting	III Boardroom	Discussion regarding the proposed EA Ammendment. Went through the proposed changes to the Commitments Table.	
	2016-02-17	steve, raj	Nalaine, Patrick, Rob	Meeting	III Boardroom	Continued discussion from Feb 10 regarding the EA Ammendment.	
	2016-02-24	steve, raj, jack	nalaine, rob, patrick	Pre-MRC Meeting	BGC Office	WQWB model discussion	
	2016-02-25	steve	nalaine	meeting	III Boardroom	meet to discuss MMER	
	2016-03-02	steve	nalaine	meeting	III Boardroom	meet with Marlo Raynold of ECCC Minister McKenna's office to discuss importance of proceeding with MMER Schedule 2 designation	
	2016-03-14	steve	nalaine	phone call		Call to discuss followup from strategy discussion with Peter Robb on Weekend.	Nalaine indicated support for concept of staged permitting.
	2016-03-22	steve	nalaine	meeting	III Boardroom	Met with Fred Oielmans, Kate Russell and Nalaine to discuss the ongoing strategic planning for land use in Tahltan Territory.	I identified a potentail conflict with land designation to the north east of TIA, between the TIA and the Klappan River
	2016-03-29	steve	nalaine	phone call		left message to provide details on information requirements for HADD at south dam and also ask for update on support letter for MMER	
	2014-04-01						

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		RCDC	Tahltan				
KEY:	TCC	Tahltan Central Council			Brian	Brian Kynoch	President Imperial
	THREAT	Tahltan Heritage Resources Environmental Assessment Team			Pierre	Pierre Lebel	Chairman Imperial
	TNDC	Tahltan Nation Development Corporation			Raj	Raj Anand	Project Development Mgr, Imperial
	AMTA	BC Aboriginal Mine Training Association			Steve	Steve Robertson	VP Corp Affairs, Imperial
	NWMDRC	Northwest Mine Development Review Committee			Byng	Byng Giraud	VP Corp Affairs, Imperial
	RCDC	Red Chris Development Company Ltd.			Don	Don Parsons	COO Imperial
	RCMC	Red Chris Monitoring Committee			Ron	Ron Martel	Environmental Superintendent, Mt Polley
	H37PC	Highway 37 Power Corp.			Denis	Denis Bernardi	Contract and Purchasing Mgr, Imperial
	BC HYDRO	BC Hydro and Power Authority			Ben	Ben Slager	Lawyer, Mogan Daniels Slager
					Jack	Jack Love	Environmental Superintendent, Red Chris
					Gord	Gord Keevil	VP Corporate Development, Imperial
					Annita	Annita McPhee	President TCC
					Curtis	Curtis Ratray	Chairman TCC
					Rick	Rick McLean	Chief, Tahltan Band
					Marie	Marie Quock	Chief, Iskut Band
					Nalaine	Nalaine Morin	THREAT Manager
					Camille	Camille Callison	THREAT Hearitage Manager
					Cynthia	Cynthia Callison	Tahltan Lawyer
					Janelle	Janelle Dwyer	Mandell Pinder Lawyer
					Gord L.	Gord Loverin	Tahltan Business Council
					Norm	Norm McLean	THREAT consultant
					Patrick	Patrick Hudson	THREAT consultant
					Bill	Bill Adsit	President TNDC
					Garry	Garry Merkyl	Chairman TNDC
					Ed	Eddie VanMierlo	VP TNDC
					Rob	Rob McPhee	President Caslemain Consultants
					Dwayne	Dwayne Day	THREAT Member
					Jerry	Jerry Asp	THREAT Member
					Vera	Vera Asp	THREAT Member - Archaeology
					Steve S.	Steve Seigner	Thunder Mountain Logging
					Arnold	Arnold Callbreath	Dena Cho and Cassiar Forest Products
					Henry	Henry Carlick	Iskut Band Superindendant
					Darrel	Daryl Bell	VP All-North Engineering
					Connie	Connie Quash	TCC Education Manager
					Ramona	Ramona Quock	TCC Human Resources
					Feddie	Feddie Louis	Iskut Band Manager Health Services
					Ed	Ed Asp	Tahltan Elder
					Jim	Jim Abou	Tahltan Elder
					Robert	Robert Simpson	President PR Associates

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		RCDC	Tahltan				
					Rob Miller	Rob Miller	Lawyer, Miller Titerle

April 4, 2016
Project No.: 0866-004

Steve Robertson
Vice President, Corporate Affairs
Red Chris Development Company Ltd.
580 Hornby Street, Suite 200
Vancouver, BC V6C 3B6

Dear Steve,

Re: Red Chris Certificate #M05-02 Amendment Support

This letter has been prepared by BGC Engineering Inc. (BGC) for Red Chris Development Company (RCDC). BGC has been requested to summarize and comment on the options for impoundment siting and embankment design considered throughout the various stages of design of the Red Chris Tailings Storage Facility (TSF)¹. Commentary on the Best Available Technologies (BAT) and Best Applicable Practices (BAP) as applied to the south valley portion of the Red Chris TSF is provided. The historical works along with the current investigative and design efforts support that the current South Dam design, as a sand dam, with conventional tailings disposal and cyclone sand as a construction material are the most appropriate option identified for the project.

1.0 Tailings Impoundment Site Selection

1.1. General

This section presents a summary of the sites considered in the various studies ranging from the Pre-Feasibility Study through the current design proposed for construction.

1.2. 1996 Site Selection – Knight Piésold

The 1996 study was carried out by Knight Piésold (KP) for Fluor Daniel Wright Ltd. in support of the American Bullion Minerals Ltd. Red Chris Project Prefeasibility Study, April 1996. At that time the waste deposition plan considered storing 253 million tonnes of potentially acid generating (PAG) waste rock and 553 million tonnes of mine tailings in a single facility. Waste rock dumps were proposed for the remaining waste rock. The KP work identified three candidate sites, referred to as A, B and C, as shown on Figure 1. Site C was the only option that provided the required capacity, was relatively close to the open pit, and avoided local fisheries habitat.

¹ The use of TSF and TIA (tailings impoundment area) are used throughout the various reports and are considered to represent the tailings impoundment consisting of the North, South, Northeast, Temporary Saddle and Reclaim Dams.

1.3. 2004 Application for Environment Assessment Certificate – AMEC

The Application for Environmental Assessment Certificate (the Application) was prepared by RCDC and their consultants and submitted in 2004. AMEC was responsible for the tailings and waste rock components of the Application. The Application was based on a required TSF storage capacity of 177 million tonnes. The reduction in the storage requirement was a result of not storing waste rock in the TSF and was the main difference between the 1996 site selection study and the Application. Section 6.16.6 of the Application states the following:

In 1996, Knight Piésold Limited conducted an assessment of potential tailings and waste rock storage areas for the Red Chris Project based on available 1:25,000 topographic mapping. The objective was to identify potential sites for the storage of up to 1 billion tonnes of combined waste rock and tailings solids. Three potential sites were identified. These are labelled as Sites A through C as shown on Figure 6.16.1 (Figure 1).

Site A – Site A is essentially the same site as the proposed tailings impoundment facility as presented in Section 3 of this application, i.e. the proposed tailings impoundment.

Site B - Site B is located in a valley tributary to Quarry Creek located approximately 6 km to the northeast of the proposed open pit and plant site. It requires the construction of two dams, one at the upstream end of the valley and the other at the downstream end of the valley, just upstream of the confluence with Quarry Creek. This is a smaller site in area and does not likely provide sufficient capacity for all of the mill tailings generated by the proposed project.

Site B would have no direct impact on Quarry Creek nor Trail Creek, however it would impact water quantity and quality within Quarry Creek both during operation and at post-closure. This site would make it impossible to direct all runoff from the open pit, waste rock dump and plant site into the tailings impoundment both during operations and during the post-closure period. Consequently, post-closure drainage from the open pit and waste rock dump would have to be directed towards Trail Creek resulting in potentially greater water quality impacts on Trail Creek than for Site A.

Site C – Site C is located within the Quarry Creek Valley at a point immediately downstream of the preferred tailings impoundment (Site A). It would require the construction of two dams, one at the north end at a site approximately 4 km downstream of the current location of the proposed Site A North Dam, with the other dam located at the south end at a site approximately at the same location of the proposed Site A North Dam. This would create a valley impoundment within the upper reach of Quarry Creek approximately 4 km in length, and at a distance of approximately 6 km from the proposed open pit and plant site. The north dam would be a very large structure in the order of 200 m in height, significantly higher than the dams required for Site A, the largest of which is the North Dam at about 90 m.

Site C is further from the open pit and plant site than Site A, resulting in greater pumping distances for mill tailings and reclaimed process water. This site would make it more difficult and probably impractical to direct all runoff from the open pit, waste rock dump and plant site into the tailings impoundment both during operations and during the post-closure period. Site C would result in

the physical removal of more of Quarry Creek than Site A does. Site C would likely have less impact on Trail Creek from a water quantity standpoint than Site A, however it is likely that post-closure drainage from the open pit and waste rock dump would have to be directed towards Trail Creek resulting in potentially greater water quality impacts on Trail Creek than for Site A. Site C would have no impact on the Unnamed Creek downstream of the proposed Northeast Dam.

Site B does not provide sufficient capacity for all of the tailings generated and was subsequently eliminated from further consideration. Each of Sites A and C offer distinct advantages, but only Site A provides adequate capacity within a reasonable proximity to the proposed open pit. Site A offers a better opportunity for long-term management of drainage from the open pit, waste rock dump and plant site area.

On the basis of this assessment RCDC elected Site A as the preferred option for the proposed tailings impoundment.

1.4. 2005 Feasibility Study – AMEC

In the 2005 AMEC report “Red Chris Project Feasibility Study – Tailings, Water and Waste Rock Management” (AMEC 2005), an update of the mine plan was presented. The revised mine plan resulted in approximately 274 M tonnes of tailings, a 55% increase in mine tailings production over the mine plan presented in the Application. No change in the TSF location was presented; however, AMEC (2005) recommended two options for shifting the North Dam to the north by 650 m and 1200 m. These options were to be considered at the next stage of design to reduce the ultimate height of the North Dam (**Figure 2**).

1.5. 2011 Detailed Design Report – AMEC

The 2011 AMEC report “Tailings Storage Facility Detailed Design Report” (AMEC 2011) presented the current TSF layout. An update to the mine plan increased the mine tailings tonnage to 302 million tonnes, a 10% increase in mine tailings production over the mine plan presented in AMEC (2005). The location of the North Dam was shifted approximately 650 m north as recommended for consideration in AMEC (2005) to reduce the ultimate height of the North Dam (Figure 3). The locations of the South and Northeast dams were unchanged.

1.6. 2013-2016 – BGC

The current TSF configuration is unchanged from the one presented in AMEC (2011). BGC considers the current tailings facility and configuration to be superior to the other options that were studied, and has not identified any other preferred sites or configurations outside of the options that were previously studied.

2.0 South Dam Embankment design

2.1. General

This section presents the evolution of the design of the Red Chris TSF South Dam.

2.2. 2004/2005

The design of the TSF embankments presented in the Application and AMEC (2005) are generally the same. The key design aspects as presented in the Application are repeated below.

The key design/construction features of the starter dams for the North Dam and the South Dam will be as follows:

- *The dams will have a central core of compacted, low permeability glacial till. The site investigations completed to date by Knight Piésold (KP) and AMEC in the impoundment area indicate that there is suitable till available for borrow purposes, within the impoundment area, at least for starter dams construction. Additional investigations are expected to confirm additional availability of till for borrow at higher elevations that can be exploited for the annual raises of the dams*
- *The low permeability central core zone of the starter dams will be tied into the till foundation, which is of low hydraulic conductivity and so forms a natural liner within the impoundment that will limit the rate of seepage loss. In most areas in the valley bottom the native till appears to be overlain by a relatively pervious sand and gravel unit (the upper aquifer). To tie the core into the native till, excavation of a cutoff trench through the pervious sand and gravels comprising the upper aquifer (where present) will be required. Based on the KP site investigation data, the depth of this cutoff trench will be within the range of zero (on the east abutment of the South Dam where till appears to be at ground surface) to in excess of 7 m towards the valley bottoms. The contact between the upper sand and gravel aquifer and the low hydraulic conductivity till along the dam profiles is at present not well defined. Seismic refraction surveys were conducted along the axes of each of the three dams in the summer of 2004, with the primary objective being to define the bedrock-overburden contact, and a secondary objective being to define the boundary between the till and the base of the overlying upper aquifer (sands and gravels)*
- *Assuming the till layer to be as extensive throughout the tailings impoundment area as indicated by the site investigations undertaken to date, it will form a natural, and effective, liner to limit seepage losses into the underlying silt and sand unit (the lower aquifer). This aquifer, apparently confined by the till layer, is inferred to be extensive throughout the impoundment area (based on the boreholes) and in excess of 50 m thick within the valley bottoms. Whether or not the natural till blanket is continuous in the valley bottom area is unknown and is unknowable, and it is likely that there are gaps through which seepage losses could be more concentrated than would otherwise be the case. However, once the area is blanketed with tailings, the tailings will serve to reduce seepage losses into the lower aquifer through any potential gaps in the till*
- *The starter dams will have upstream and downstream shells (at 2H:1V and 2.5H:1V slopes respectively) of compacted, well-graded sand and gravel that appears plentiful within the impoundment area on the basis of site investigations completed to date. Waste rock from pre-production pit stripping may also be used for dam construction.*

For subsequent raising of the North Dam and the South Dam, the following are planned:

- *The central till core of the dams will be raised vertically, via the centerline method of construction. The till core will be narrowed with increasing elevation.*
- *The dams will be raised on an annual basis.*
- *The downstream shell of the dams will be raised and extended at a 4H:1V overall slope. The downstream shells will be comprised of:*
 - *Non-reactive (NAG) cycloned tailings sand, pervious (free draining) and compacted (where compaction is required); and*
 - *Locally available clean and well-graded sand and gravel (drainage blanket), and possibly*
 - *NAG waste rock from the open pit (for rock under-drains)*
- *Upstream support for each successive dam raise will be via random fill (or cycloned tailings sand) placed upstream of the core zone on a wide, above-water tailings beach. This assumes that:*
 - *Tailings discharge occurs from the North Dam and the South Dam.*
 - *The water balance of the impoundment is such that accumulation of large volumes of excess water does not preclude maintenance of above-water tailings beaches in front of each dam. For the 27,500-tpd-throughput rate, a water surplus is expected in all years, meaning that either surplus water is discharged, or excess water is permitted to accumulate within the tailings impoundment. In the latter case, wide above water beaches likely cannot be maintained and more expensive downstream dam raising would be required. Use of cycloned sand cell construction for maintenance and effective “stacking” of upstream beaches could be used to maintain above water beaches even with significant surplus water accumulation in the tailings impoundment.*

Use of Tailings for Dam Construction

Use of cycloned sand produced from the Red Chris tailings for raising of the tailings dams is considered economically attractive and technically feasible for the project. A number of tailings dams in British Columbia are constructed using clean sand produced by cycloning of the tailings stream. One example of this practice is the L-L Dam at the Highland Valley Copper Mine. This dam started as a conventional earthfill dam, with a central till core and upstream/downstream shells of compacted sand and gravel (i.e., the same basic design proposed for the Red Chris starter dams), and later converted to a cycloned sand dam, raised via the centerline method (as proposed for Red Chris), with a central till core, downstream shell of compacted cycloned sand (hydraulically placed and compacted via dozers), and upstream support provided by the tailings beach.

Sulphides removal via flotation of the rougher tailings is the process planned for implementation for the last two years' tailings discharge to the Huckleberry Mine tailings impoundment. This will result in, for closure, above water NAG tailings beaches separating the tailings dams from the closure water pond. The same scheme will be implemented at Kemess for the closure configuration of that tailings dam.

Placement of cycloned sand on the downstream shells of the dams reduces the storage volume required in the tailings impoundment by an equivalent amount. Assuming 16 years of cycloned sand production, with 1.37 million tonnes/year of sand placed in the downstream dam shells of the North Dam and the South Dam, the decrease in storage volume required within the tailings impoundment would total about 17 Mm³. This would mean an approximately 4.5 m reduction in the height of the tailings dams required.

Cycloned Sand for Upstream Shell Construction and Beach Development

Cycloned sand will also be used to advantage for raising of the upstream shell of the North and South Dams (some degree of upstream support is required for support of the centerline till core raises), and for acceleration of upstream beach development. At Kemess and the Highland Valley Copper L-L Dam, for example, cycloned sand placement to the upstream of the dam is undertaken for both of these purposes. Cycloned sand placement to the upstream of the dam can be carried out either in cells (providing more effective control on sand placement) or via open-end discharge (both methods are employed at Kemess). The ability to accelerate raising of the upstream beach (due to the steeper slopes obtainable using cycloned tailings as opposed to whole tailings) is advantageous for Red Chris as the tailings impoundment water balance indicates an annual surplus. This surplus can either be discharged, or retained (within reasonable limits) within the impoundment, resulting in a water pond that increases in volume on an annual basis (as is planned for the first few years of operation of the facility).

Above Water Tailings Beaches at Closure

Assuming that the total tailings stream will classify as potentially acid generating, then means of preventing oxidation of the tailings and development of ARD over the closure phase (i.e. perpetuity) include:

- 1. Full submergence of all tailings below a suitable depth of water cover (typically at least 2 m). This means that the closed water pond will be in direct contact with all three dams.*
- 2. Sulphides removal via flotation, creating two separate tailings streams. The sulphides bearing tailings stream would be discharged into relatively deep portions of the pond where permanent submergence can be assured. The non-reactive tailings stream could be used to construct permanent, above-water tailings beaches to separate the dams from the closed water pond.*
- 3. Above water beaches of potentially acid-generating tailings would be formed in front of the dams, with the potential for development of ARD due to oxidation of the non-submerged tailings, hence requiring provision for perpetual water treatment.*

Option 1 was considered the best alternative for many years, but this is now changing due in large part to the recognition of the increased dam safety risk (hence closure liability) associated with the "geochemical security" associated with complete flooding provided by water-retaining tailings dams. The design and construction of the dams would be more complex (and costly) were this approach to be adopted for Red Chris, particularly given the presence of upper and lower aquifers.

Option 2 is seeing increasing preference and use, and is the closure scenario that will be used for the tailings dams at the Huckleberry and Kemess mines. At both of these mines, sulphides removal via flotation is/will be used to produce a non acid generating tailings stream for the

development of above water tailings beaches at closure. At Kemess, this system is in operation now in conjunction with the production of non-acid generating cycloned sand for downstream shell construction. At Huckleberry, sulphides removal will be implemented, for operation during the final two years of mine life. The advantages of sulphides removal for the development of above water tailings beaches at closure are as follows:

- *From a dam safety perspective, this approach is much favored over the practice of total submergence of all tailings and having the water pond in direct contact with the dam(s).*
- *The seepage reduction afforded by an above-water tailings beach renders design and construction of the tailings dam less complex and less expensive. This is of particular significance for the Red Chris project due to the presence of the lower aquifer and questions pertaining to the continuity of the natural till blanket that is being counted upon to provide a degree of hydraulic separation between the tailings impoundment and the lower aquifer.*
- *Covering of potentially acid generating tailings with a blanket of non acid generating tailings provides for additional margin of safety against oxidation of the potentially acid generating tailings, in addition to the water cover.*

For the Red Chris project, it is assumed that above-water NAG tailings beaches will be present at closure upstream of both the North Dam and the South Dam.

Tailings Delivery Systems

The tailings distribution system will evolve through the life of the project. For all of the operating life of the tailings impoundment, above water tailings beaches will be required to separate the water pond from each of the North Dam and South Dam. No tailings discharge from the Northeast Dam is required. For most of the mine life, it is not required that above water beaches upstream of the North Dam and South Dam comprise NAG tailings. For the final few years of operation, however, it will be necessary to discharge only NAG tailings from the dams for development of the NAG tailings beaches required for the closure configuration of the impoundment.

2.3. 2011 Detailed Design Report

Section 3.3 of AMEC (2011) South Dam presented the basis for the updated South Dam design (reproduced below in italics).

The design of the South Dam starter embankment is illustrated in plan on Drawing VM00532.5.19 and in section on Drawing VM00532.5.20. The south starter dam will be constructed as a sand and gravel (Zone 3B) embankment.

The dam will be raised in annual stages, with upstream support provided by cyclone sand prior to beach raising. The design of the dam from its starter configuration to its ultimate configuration is illustrated in plan on Drawing VM00532.5.37, and in sections on Drawings VM00532.5.38 and VM00532.5.39. The downstream cyclone sand shell will be constructed hydraulically, with dozer compaction of the sand per operations in the same manner as the North Dam. The cycloned sand shell (Zone 4) will be underlain by a blanket/finger drain comprising sand and gravel (Zone 3C), with a maximum fines content of 5% to facilitate good under-drainage.

A till core is not a design component of this dam for the following reasons:

- *The South dam starter embankment is not required to retain process water. The process water reclaim pond will be located well to the upstream of the dam. Tailings beaching operations will be such that a wide above-water tailings beach is developed and maintained against this dam.*
- *For a significant portion of the South Dam alignment, including the west abutment area, the upper till unit is absent (see Drawing VM00532.5.11). As such, a till core cutoff trench to key into a native unit of low hydraulic conductivity is not viable.*
- *Groundwater modeling using a three-dimensional MODFLOW model, and a two-dimensional SEEP/W model, indicates:*
 - *For the closure configuration, the predicted rate of seepage loss from the tailings impoundment is essentially no different for the case with a till core than is the case without. It is the wide tailings beach, the head loss from downward seepage through the low hydraulic conductivity tailings, and the valley bottom aquifers that govern seepage through and below the dam, rendering a till core redundant.*
 - *The predicted rate of seepage loss (about 20-35 litres/sec, see Section 11.5) from the tailings impoundment in its closure configuration, including recharge into the underlying aquifers, and seepage through the South Dam, is immaterial in terms of the closure water balance (Section 10.5). As a result, there is no concern associated with the ability to maintain a closure water pond (even in dry year scenarios), nor in maintaining saturation/flooding of PAG cleaner tailings, providing these are discharged into the northern half of the tailings impoundment (see Section 7.3).*
- *The two-dimensional SEEP/W model of the South Dam and pond configuration at closure, incorporating boundary conditions derived from the MODFLOW modeling, predicts a zone of unsaturated tailings to a distance of about 300 m upstream of the South Dam. Provided that deposition of PAG tailings within this area is prevented, readily achievable as these tailings will be in the cleaner tailings pipeline only, this is of no consequence in terms of water quality at closure, and is of benefit in terms of the long term stability of the South Dam.*

For the South Dam, it is the upstream tailings beach (total tailings and cyclone plant overflow), rather than a till core, that will serve as the seepage reduction measure.

The maximum fines content for Zone 4 cyclone sand will be 10%. A fines content of 15% may be designated above a certain elevation, to maximize use of sand and given that it is in the lower portion of the cyclone sand shell where a high hydraulic conductivity (lower fines content) is most important. The cyclone sand will be compacted to at least 98% of the maximum dry density as determined by the Standard Proctor test (ASTM D598).

Under-drainage for Zone 4 cyclone sand will be provided by a drainage blanket of Zone 3C sand and gravel (maximum 5% fines content).

The development of the South Dam as a pervious, cyclone sand structure imposes constraints on the deposition of tailings within the impoundment. Specifically, the sulphide-bearing cleaner tailings stream (which includes the cleaner tailings and the sulphides rejected from the additional flotation of the rougher tailings must be discharged into the impoundment such that they will be permanently submerged (below the water pond) or below the phreatic surface.

2.4. South Dam Design Update 2011-2016

At the request of RCDC, BGC provided comment (BGC 2016, see Appendix A) on Commitment M11 of the Red Chris Environmental Assessment Certificate (EAC 2005) and presented RCDC's planned actions to satisfy the intent of this Commitment in consideration of the updated understanding of the South Dam foundation conditions and the detailed design presented in the AMEC report "Tailings Storage Facility Detailed Design Report" (AMEC 2011). BGC 2016 presented discussion of Commitment M-11 of the Application along with seepage modeling results for the South Dam (SD) as a till core and a sand dam. BGC 2016 stated the following:

"Two-dimensional finite element seepage modeling (using Seep/W) of the SD at various stages of its development as a sand dam and alternatively as a dam with a till core was carried out reflecting the lack of a naturally occurring near surface till blanket beneath the SD. The modeling captures the pervious nature of the foundations in the South Dam area, along with an extensive tailings beach upstream of the SD. Modeling of both the sand and the till core dam options shows a phreatic surface that drops to foundation elevation upstream of the SD and remains at or below the SD foundation level. This modeling is interpreted as indicating that the neither the location of the phreatic surface or the amount of seepage past the dam is influenced by the presence of a till core.

The last sentence above is the key conclusion from that work – a till core in the sand dam does not influence the amount or quality of seepage through the dam.

2.5. Best Available Technology and Best Applicable Practices

The selection of the best available technology (BAT) is to consider the site specific conditions and objectives for a project. As stated by Dr. Dirk van Zyl, Mt. Polley Independent Review Panel member, in his letter of 18 August 2015 to the Honorable Minister Bennett, "In my opinion, BAT is not a single technology; its selection is based on a site-specific risk management process with the outcome of a stable and resilient tailings deposit." (See Appendix B.)

The Mt. Polley Panel (British Columbia 2015) made seven recommendations to improve practice and reduce the potential for future failures. The BC Government accepted all of the recommendations. The Panel recommendations are below in italics; comments about the implementation of each applicable recommendation at Red Chris are added:

1. Implement BAT using a phased approach:
 - ***For existing tailings impoundments.*** Rely on best practices for the remaining active life.
 - ***For new tailings facilities.*** BAT should be actively encouraged for new tailings facilities at existing and proposed mines.

- ***For closure. BAT principles should be applied to closure of active impoundments so that they are progressively removed from the inventory by attrition.***

The Red Chris TSF is an existing impoundment currently in operation that requires expansion into to the south valley to allow for the continued operations of the mine. As an existing impoundment the reliance is on best practices for the remaining life of the facility. However, BATs applied to the Red Chris TSF were presented in BGC (2016) and are repeated in Section 2.6 in relation to specific Mt. Polley Panel recommendations.

2. Improve corporate governance:

- *Corporations proposing to operate a tailings storage facility (TSF) should be required to be a member of the Mining Association of Canada (MAC) or be obliged to commit to an equivalent program for tailings management, including the audit function.*

The Red Chris Development Company follows industry best practices, including the applicable guidance provided by the CDA and MAC.

3. Expand corporate design commitments:

- *Future permit applications for a new TSF should be based on a bankable feasibility that would have considered all technical, environmental, social and economic aspects of the project in sufficient detail to support an investment decision, which might have an accuracy of +/- 10-15%. More explicitly it should contain the following:*
 - *A detailed evaluation of all potential failure modes and a management scheme for all residual risk*
 - *Detailed cost/benefit analyses of BAT tailings and closure options so that economic effects can be understood, recognizing that the results of the cost/benefit analyses should not supersede BAT safety considerations*
 - *A detailed declaration of Quantitative Performance Objectives (QPOs).*

A Failure Modes and Effects Analysis workshop has been carried out for the Red Chris TSF, the findings of this workshop will be available at the end of April 2016. QPOs will be identified in the next version of the Operations, Maintenance and Surveillance Manual.

4. Enhance validation of safety and regulation of all phases of a TSF:

- *Increase utilization of Independent Tailings Review Boards.*
- *Utilize the concept of Quantitative Performance Objectives to improve regulator evaluation of ongoing facilities.*

Red Chris has implemented an Independent Technical Review Board consisting of four industry experts as selected by Imperial Metals, the Tahlitan General Council and the Ministry of Energy and Mines. The Red Chris board meets no less that twice a year and provides high level review of the design and operation of the TSF, including the Operations, Maintenance and Surveillance Manual where the QPOs will be listed.

5. Strengthen current regulatory operations:

- *Utilize the recent inspections of TSFs in the province to ascertain whether they may be at risk due to the following potential failure modes and take appropriate actions*
 - *Filter adequacy*
 - *Water balance adequacy*
 - *Undrained shear failure of silt and clay foundations*

BGC has addressed the first and third bullet in (BGC June 30, 2015), AMEC has addressed the water balance. The IERP has reviewed the submission.

6. Improve professional practice:

- *Encourage the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC) to develop guidelines that would lead to improved site characterization for tailings dams with respect to the geological, geomorphological, hydrogeological and possibly seismotectonic characteristics.*

No comment applicable.

7. Improve dam safety guidelines:

- *Recognizing the limitations of the current Canadian Dam Association (CDA) guidelines incorporated as a statutory requirement, develop improved guidelines that are tailored to the conditions encountered with TSFs in British Columbia and that emphasize protecting public safety.*

No comment applicable.

2.6. Best Available Technologies

Examples of Best Available Technologies (BAT) for tailings storage presented by the Mt. Polley Independent Review Panel are discussed below with the BAT in italics and BGC commentary following:

1. *Eliminate surface water from the impoundment*

Total elimination of surface water from the impoundment is not practicable as a small surface pond is required to maintain the PAG tailings submerged (PAG tailings are to be deposited into the central portion of the impoundment). The above water beach requirement dictates that the pond size is actively managed and kept well away from the dams. Also, the pond serves to collect runoff of contact water from the mine and mill facilities.

2. *Promote unsaturated conditions in the tailings with drainage provisions*

The above water beach in conjunction with the effective natural drainage provided by the foundation sand and gravels will maintain the dam and tailings immediately upstream of the dam in a drained condition and result in a phreatic level within the foundation below the South Dam.

3. *Achieve dilatant conditions throughout the tailings deposit by compaction*

Effective downward drainage through the tailings and the loading provided by the actively developing beach above water will both contribute to increasing the density of

the tailings immediately upstream of the dam. This, combined with the unsaturated conditions of the downstream shell and immediately upstream of the shell will preclude rapid strength loss of these materials due to shearing or earthquake shaking.

The BAPs that have or will be incorporated into the Red Chris TSF operations are discussed in Section 2.7.

2.7. Best Available Practices

The design and operations (existing and future) at the Red Chris Mine consider a number of BAPs. A list and description of the BAPs is provided below:

- A Risk Register has been developed for the project and a Failure Modes and Effect Assessment (FMEA) workshop was carried out for the Red Chris TSF; the report for that session has not been finalized. The development of the risk register and the execution of the FMEA workshop allows for the early identification of risks to the project and introduction of risk management strategies to avoid or reduce those risks.
- For many mines, discharge of surplus water is not considered until after the mine begins operation. At Red Chris, the need for this was recognized at the outset; hence the large effort made in water quality modeling in support of a water discharge permit. Water quality modeling indicates acceptable water quality with no requirement for an operations period water treatment plant.
- The process plant includes an additional flotation circuit to separate the NAG and PAG tailings, most of which (85%) will be NAG. This allows for more control over the depositional strategy of the PAG tailings and the ability to direct them into the central, lower portion of the TSF where they will be flooded. This will allow for the development of substantial above water (unsaturated) NAG tailings beaches against the North and South Dams.
- The safety of the South Dam depends on a wide above water beach which requires that the pond size be proactively managed. The substitution of a wide above water beach of NAG tailings for a core allows development of a partially saturated condition in the tailings immediately upstream of the South Dam, and a resulting phreatic surface that is projected to be below the dam fill.
- Interception of seepage downstream of the South Dam via a system of seepage recovery wells is planned as a measure to protect the downstream receiving environment.

3.0 Alternate Tailings Technologies

This section presents a discussion of the alternative tailings technologies that could be considered at the Red Chris project and provides a high level comparison of the alternatives to conventional slurry deposition that is currently in operation. A summary of tailings technologies is provided in Appendix C. Alternative tailings technologies differ primarily by the water content of the tailings. The water content of the tailings dictates the method of transport, with centrifugal pumps typically used for conventional (up to 35% solids content) and thickened tailings (up to 65% solids content). Above 65% to about 75% solids content the tailings can still be pumped but require positive displacement pumps. Filtration is generally required to achieve a solids content above 75%,

which requires transport by conveyor or by trucks. For this discussion we have included paste with thickened tailings and discuss the current tailings transport method utilized at site (conventional slurry deposition) with thickened and filtered tailings.

3.1. Existing Site Experience

Tailings are currently deposited in the north valley as a slurry (about 35% solids) between the North Dam and Temporary Saddle Dam. A cyclone system is to be installed in the spring of 2016 to begin producing upstream shell material for the North Dam. Later in 2016, downstream shell material for the North Dam will be produced by the cyclones.

Adopting an alternative tailings technology at this stage of the project would require the conversion of the existing infrastructure and the inclusion of the existing conventional tailings deposit in the north. The design, permitting, and implementation of this conversion would require significant time and would result in a suspension of operations. The design and procurement of the required filter plant(s) is typically on the order of 24- 36 months. Conversion to thickened tailings could require 12-24 months.

The BAT and BAP implemented or planned to be implemented for the project utilizing the current conventional slurry deposition plan were presented in Section 2.6 and 2.7, respectively; comparisons to the operation with thickened and filtered tailings are included in the two following sections.

3.2. Comparison to Thickened Tailings

The transport and deposition of thickened tailings are similar to conventional tailings. Thickened tailings can be advantageous when water recovery in the mill is a priority. Utilizing less transport water results in a tailings stream that is more abrasive during transport and less susceptible to segregation when deposited. Lower segregation would result in an upstream beach with a higher fines content and, potentially, a higher degree of saturation near the dam. Based on the foundation conditions the downstream shell of the South Dam, for conventional or thickened tailings, would be constructed out of cyclone sand constructed with a downstream slope of 3H:1V. The seepage through a thickened tailings deposit would be similar to that from a conventional tailings deposit. The management of PAG tailings would be similar for thickened and conventional tailings, with the objective to maintain the PAG tailings saturated as discussed in Section 2.7.

The North and South Dams rely on the production of cyclone sand for use as a construction material. To operate the cyclones, water would have to be added to the thickened tailings stream. Fugitive dusting will be a concern for both conventional and thickened tailings considering the size of tailings beaches required. The presence of a wetted beach (from constant tailings deposition reduces dusting concerns for conventional and thickened tailings deposition; however, it is expected that some active management would be required to reduce fugitive dusting from the large exposed tailings beaches that result from either technology.

The size of the tailings supernatant pond for a thickened tailings deposit would typically be smaller than a comparable conventional tailings deposit with no ability to discharge excess water.

Considering that Red Chris will have a permit to discharge excess water and a requirement to maintain a large above water beach in front of the South Dam, there is no significant advantage to adopting thickened tailings as the tailings technology for the project.

3.3. Comparison to Filtered Tailings

The operation of a filtered tailings facility is considerably different than a conventional tailings facility. Instead of hydraulically transporting and placing the tailings, as with conventional or thickened tailings, filtered tailings are transported to the TSF by conveyor or truck and placed in lifts. Thus, in some ways a filtered tailings deposit more closely resembles a waste rock dump than a conventional tailings impoundment.

Filtered tailings are often considered where water recovery in the mill is considered a top priority. This is not the case at Red Chris, where it is estimated that the site water balance will be in an excess condition within the first few years of operation. Foundation conditions for a filtered tailings dump still require a foundation consistent with that required for the stability of the conventional or thickened tailings option. It would be expected that seepage from a filter tailings dump would be less than from conventional or thickened tailings (assuming similar sized supernatant ponds) during operations but may be similar during the closure period if the PAG tailings are to remain saturated.

Maintaining saturated PAG tailings within a filtered tailings shell is not well understood and creates a significant risk to the project until such time that the appropriate design work could be developed and executed. As a filtered tailings dump would have no supernatant pond, a separate water retaining facility would be required to manage site contact runoff and slurried tailings in the event of filter plant upset. The water and slurry retention could be developed between the North Dam and Temporary Saddle Dam but would affect the storage capacity of the TSF and would require integration into the new tailings technology plan. A revised water management plan with extensive water interception/diversion structures would be required to minimize the generation of contact water and potential to remobilization of tailings. Fugitive dusting would be a greater concern for a filter tailings dump than the conventional tailings impoundment as there would be more exposed, dry tailings.

There are significant uncertainties that would be associated with changing to filtered tailings technology at Red Chris. Most important is the uncertainty associated with PAG tailings management in comparison to the proven BAP of saturation of PAG tailings as will be implemented in the current tailings deposition plan. There is also uncertainty associated with implementing tailings filtration at the Red Chris production rates. Because the conservation of water in the plant is not a critical operating requirement of the Red Chris project and because the South Dam and the tailings immediately upstream of the dam are expected to remain unsaturated in the current operating plan, the potential advantages with adopting filtered tailings as the tailings technology for the project are outweighed by the increased uncertainty.

4.0 Summary

The objective of the Red Chris TSF is to provide safe containment for the tailings while minimizing the impact to the downstream environment. Based on the above discussion, there does not appear to be an appreciable advantage to thickened tailings over conventional tailings, even ignoring the shutdown period that would be required to design, permit and implement the new technology. There are some advantages in physical stability and seepage associated with filtered tailings but there are offsetting disadvantages related to increased dusting, the requirement for a separate management facility for tailings during upset conditions and contact water, and the increased uncertainty associated with the long-term behaviour of the PAG tailings in an unsaturated dump of filtered tailings. With the ability to discharge water to manage the pond size, the production of a large, unsaturated shell from cyclone sand, the development of a wide beach upstream of the dams, and the provision to keep the PAG tailings saturated, the current tailings deposition plan and the current configuration of the TSF appear to be the Best Available Technology for the current condition of the Red Chris site.

5.0 CLOSURE

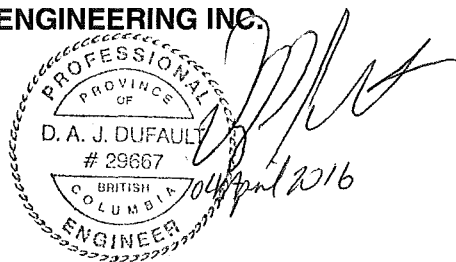
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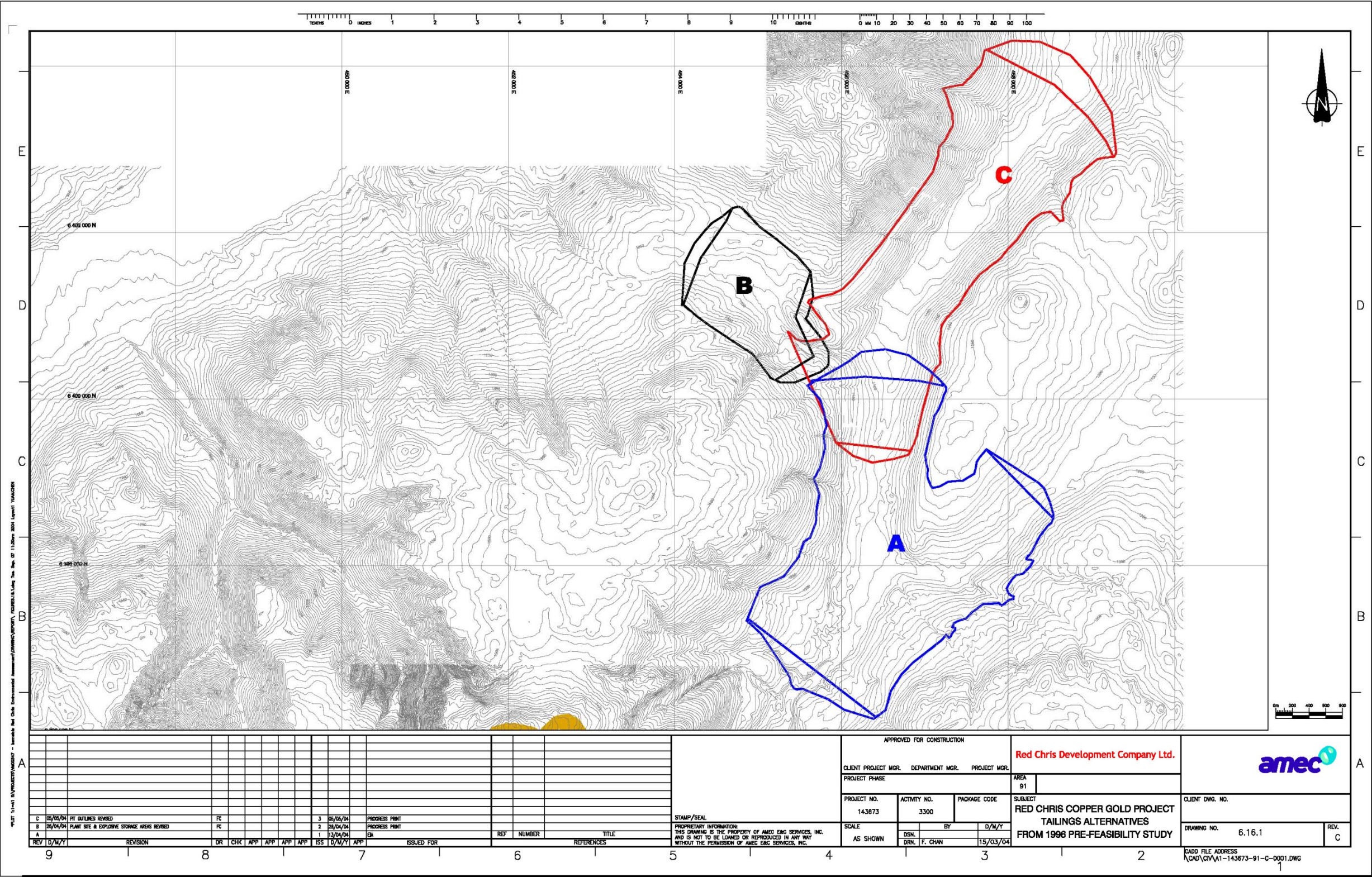


Figure 1. TSF Layout as presented in the Application (same as the 1996 KP layouts)

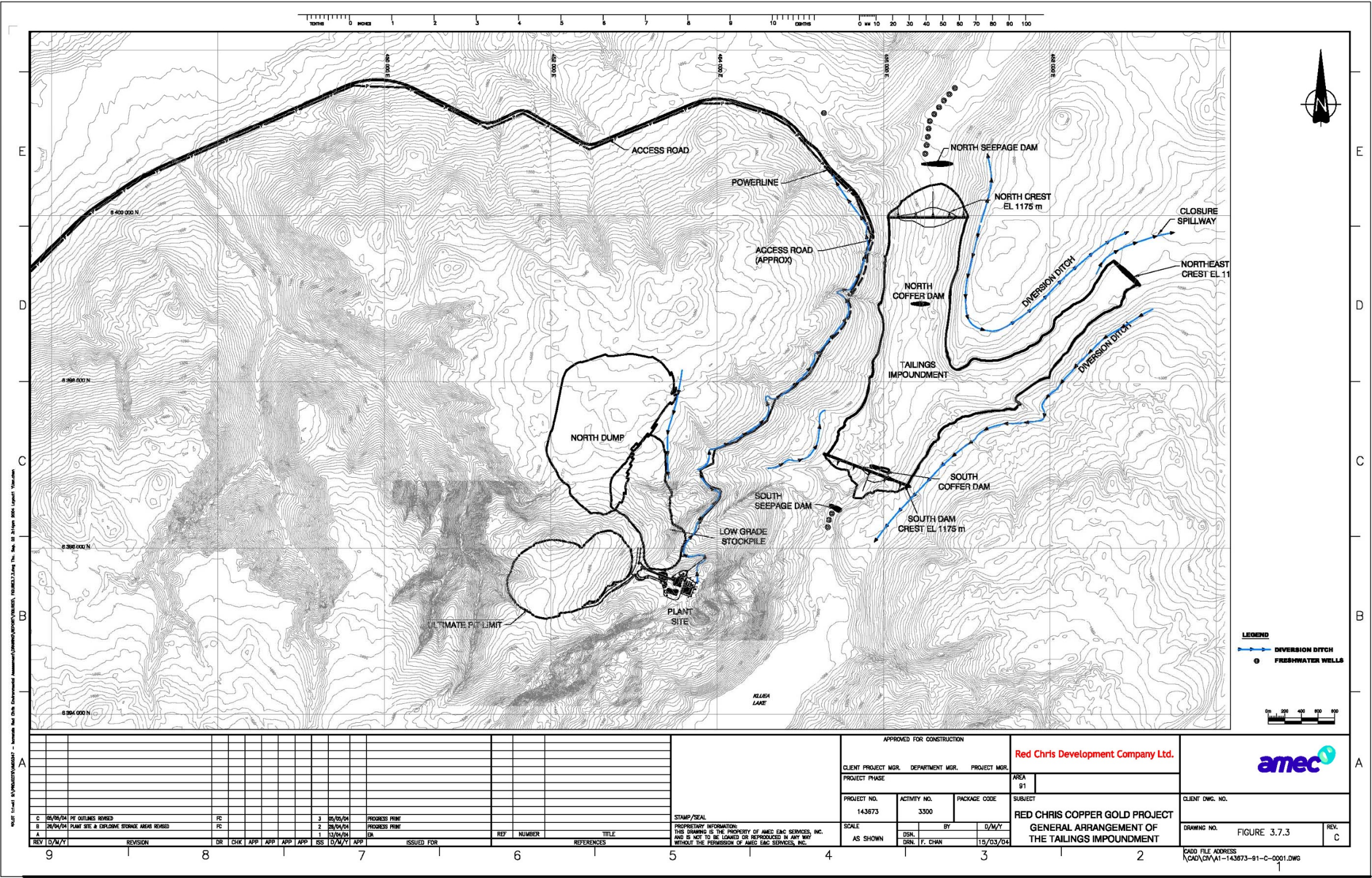
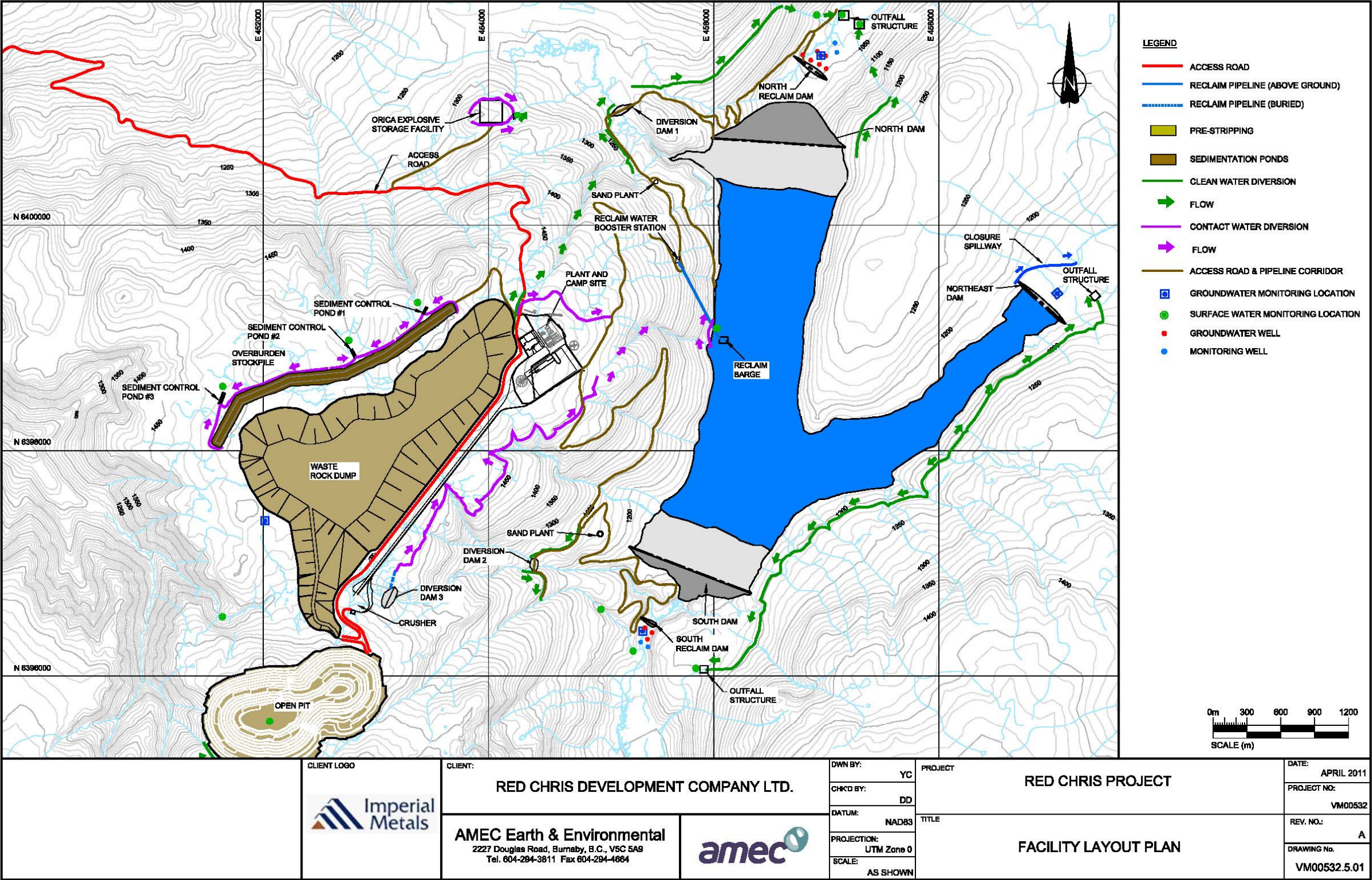


Figure 2. 2005 TSF Layout



S:\PROJECTS\VM00532 - Red Chris\Drawings\Task 5.7 Tailings Dam\RC-FIGURE 50 YEAR 29.dwg - Figure 3.14 - Apr. 14, 2011 2:56pm - yuan.chen

Figure 3. 2011 TSF Selected Layout

APPENDIX A

EA COMMITMENT M11 DISCUSSION

March 17, 2016
Project No.: 0866-004

Raj Anand, P.Eng.
Manager of Projects
Red Chris Development Company Ltd.
580 Hornby Street, Suite 200
Vancouver, BC V6C 3B6

Dear Mr. Anand,

Re: EA Commitment M11 Discussion

1.0 INTRODUCTION

This memorandum has been prepared by BGC Engineering Inc. (BGC) for Red Chris Development Company (RCDC). BGC has been requested to comment on Commitment M11 of the Red Chris Environmental Assessment Certificate (EAC) (2005) and present RCDC's planned actions to satisfy the intent of this Commitment in consideration of the updated understanding of the South Dam foundation conditions and the detailed design presented in the AMEC report "Tailings Storage Facility Detailed Design Report" (AMEC 2011).

2.0 COMMITMENT M11

Commitment M11 is one of a number of commitments attached to the EAC received for the project. M11 was developed to capture the language related to proposed tailings impoundment seepage reduction measures presented in the "Red Chris Project Feasibility Study – Tailings, Water and Waste Rock Management" (AMEC, 2005) report, which presented the feasibility design for the tailings impoundment component of the Environment Assessment Certificate application.

Commitment M11 states the following:

Seepage reduction measures will be employed to limit the rate of seepage. These include the following:

- The dam designs will include a core of compacted, low hydraulic conductivity glacial till to limit seepage through the dam.*
- The core zones for each dam will be tied into the native foundation till blanket; effectively cutting off seepage flows through the high hydraulic conductivity sands and gravels comprising the upper aquifer.*

- *The tailings discharged into the impoundment will, once the impoundment is well developed beyond the first few years of operation, serve to limit the rate of seepage through the foundation soils. This will be of particular benefit in any areas where the natural glacial till blanket is discontinuous and there is direct communication between the upper and lower aquifers.*
- *There may be a need for a deep seepage cut-off to prevent the development of unacceptably high seepage pressures in the lower aquifer.*

3.0 COMMITMENT M11 DISCUSSION

Red Chris Feasibility Study was completed in 2004 and it was submitted as part of the EA Application. On the basis of initial investigation at this stage, it was thought that a continuous, near surface till blanket existed beneath the South Dam (SD) and south impoundment area. The Feasibility Study also indicated that additional investigations would be required to confirm the continuity of the till layer. Further site investigations carried out in 2010 (AMEC 2011) and 2015 (BGC 2016) have determined that such a continuous till blanket does not exist beneath the SD. AMEC (2011) presented the dam design section for the SD modified to suit the actual foundation conditions, replacing the centerline till core design section with a sand and gravel starter dam (to be raised as a centerline dam using cyclone sand). The basis for the design change was presented in AMEC 2011 and is not discussed further herein.

The seepage reduction measures listed in Commitment M11 and presented in the AMEC 2011 report are restated below in bold text along with commentary on the SD design given the updated understanding of the foundation conditions of the SD area:

‘The dam designs will include a core of compacted, low hydraulic conductivity glacial till to limit seepage through the dam.’

Two-dimensional finite element seepage modeling (using Seep/W) of the SD at various stages of its development as a sand dam and alternatively as a dam with a till core were carried out reflecting the lack of a naturally occurring near surface till blanket beneath the SD. The modeling captures the pervious nature of the foundations in the South Dam area, along with an extensive tailings beach upstream of the SD. Modeling of both the sand and the till core dam options shows a phreatic surface that drops to foundation elevation upstream of the SD and remains at or below the SD foundation level. This modeling is interpreted as indicating that the neither the location of the phreatic surface or the amount of seepage past the dam is influenced by the presence of a till core. Snapshots of the Seep/W model output for the sand dam and till core sections at the end of 2017 (Year 1) are shown in Figures 1 and 2 respectively. Output files for the dam sections at the end of 2025 (Year 10) are shown in Figures 3 and 4 respectively.

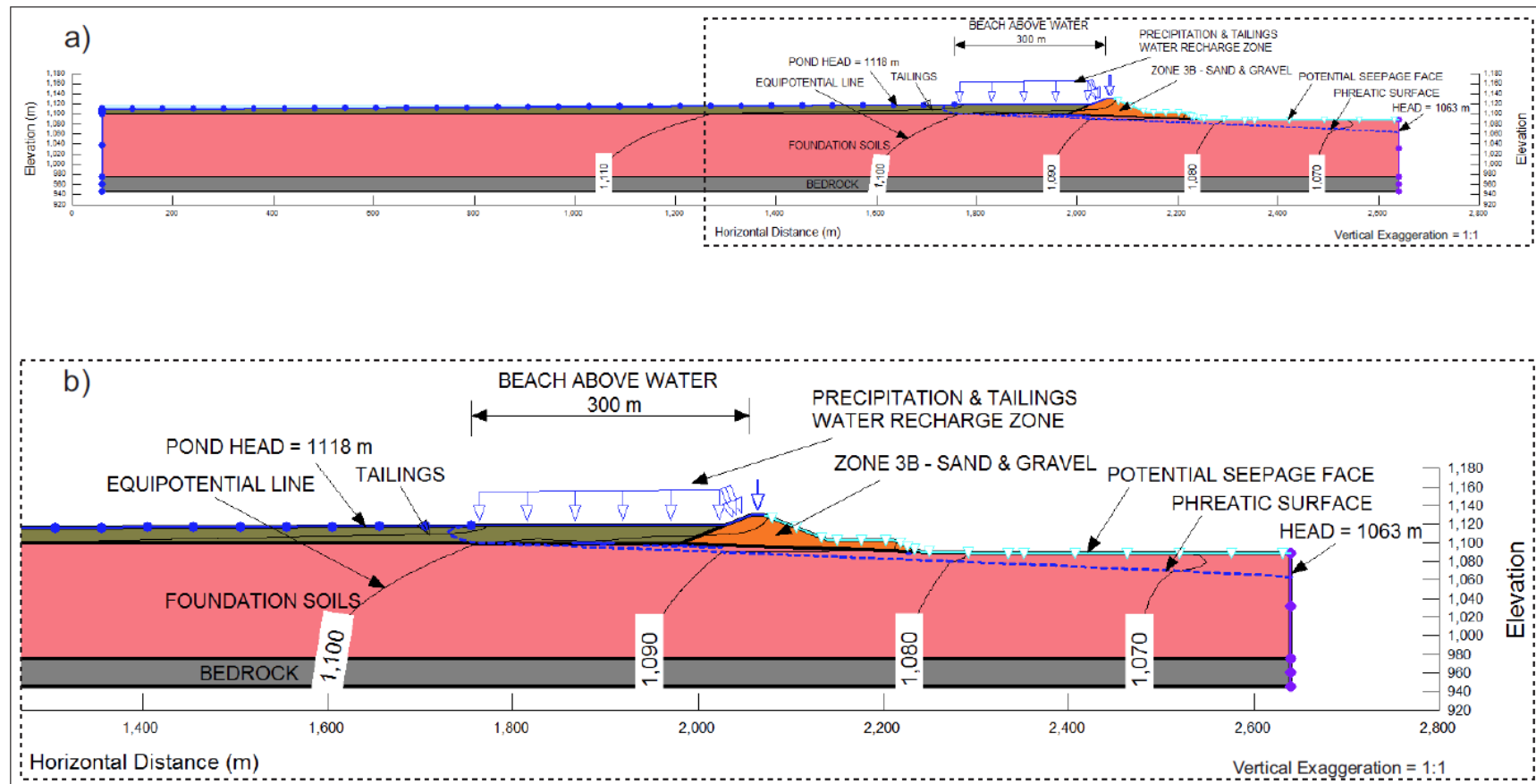


Figure 1. Seep/W Model Snapshot: Sand Dam Year 1. a) Section through the South Tailings Impoundment Area (TIA); b) Section through the dam and its foundation.

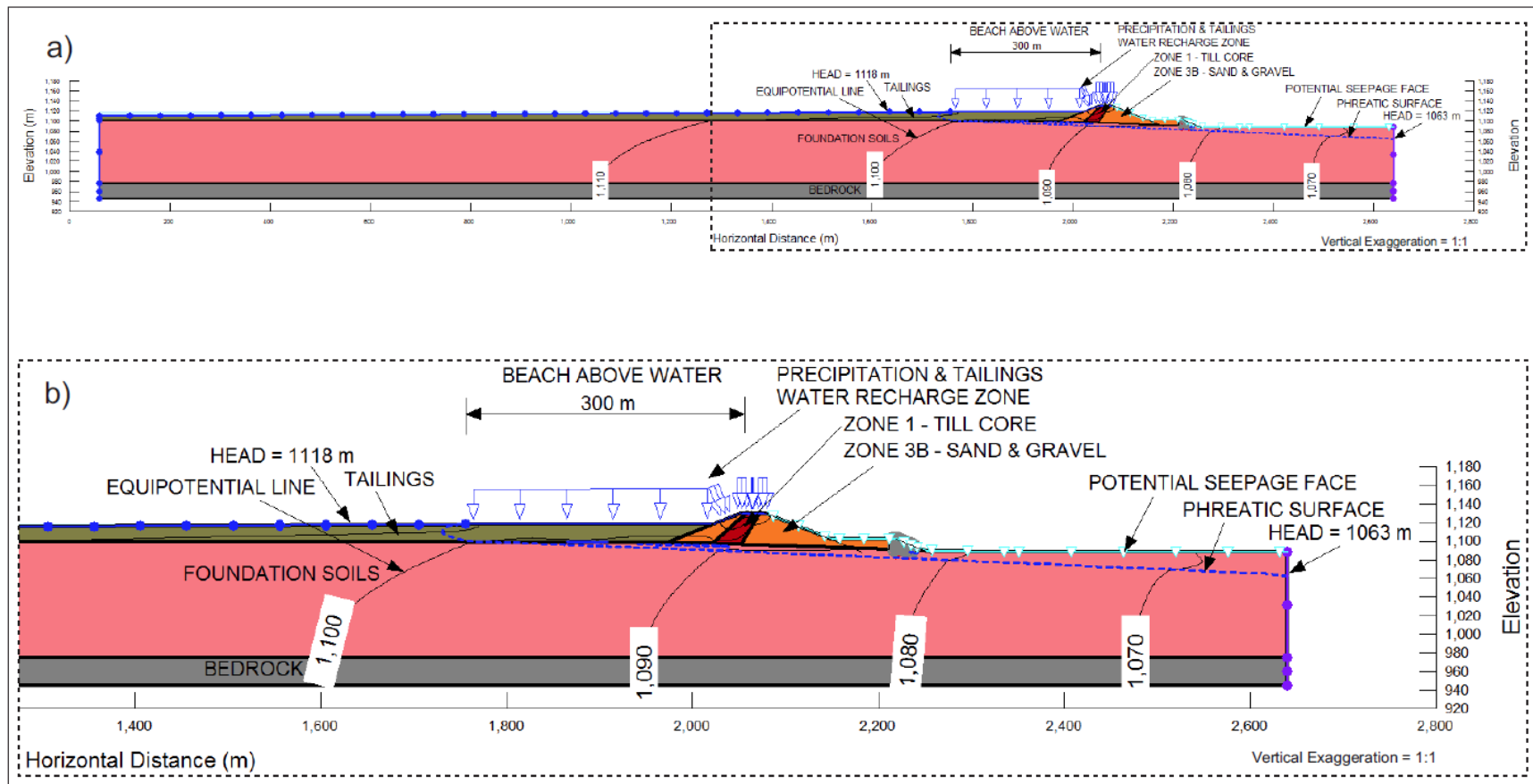


Figure 2. Seep/W Model Snapshot: Till Core Year 1 a) section through the South Tailings Impoundment Area (TIA); b) section through the dam and its foundation.

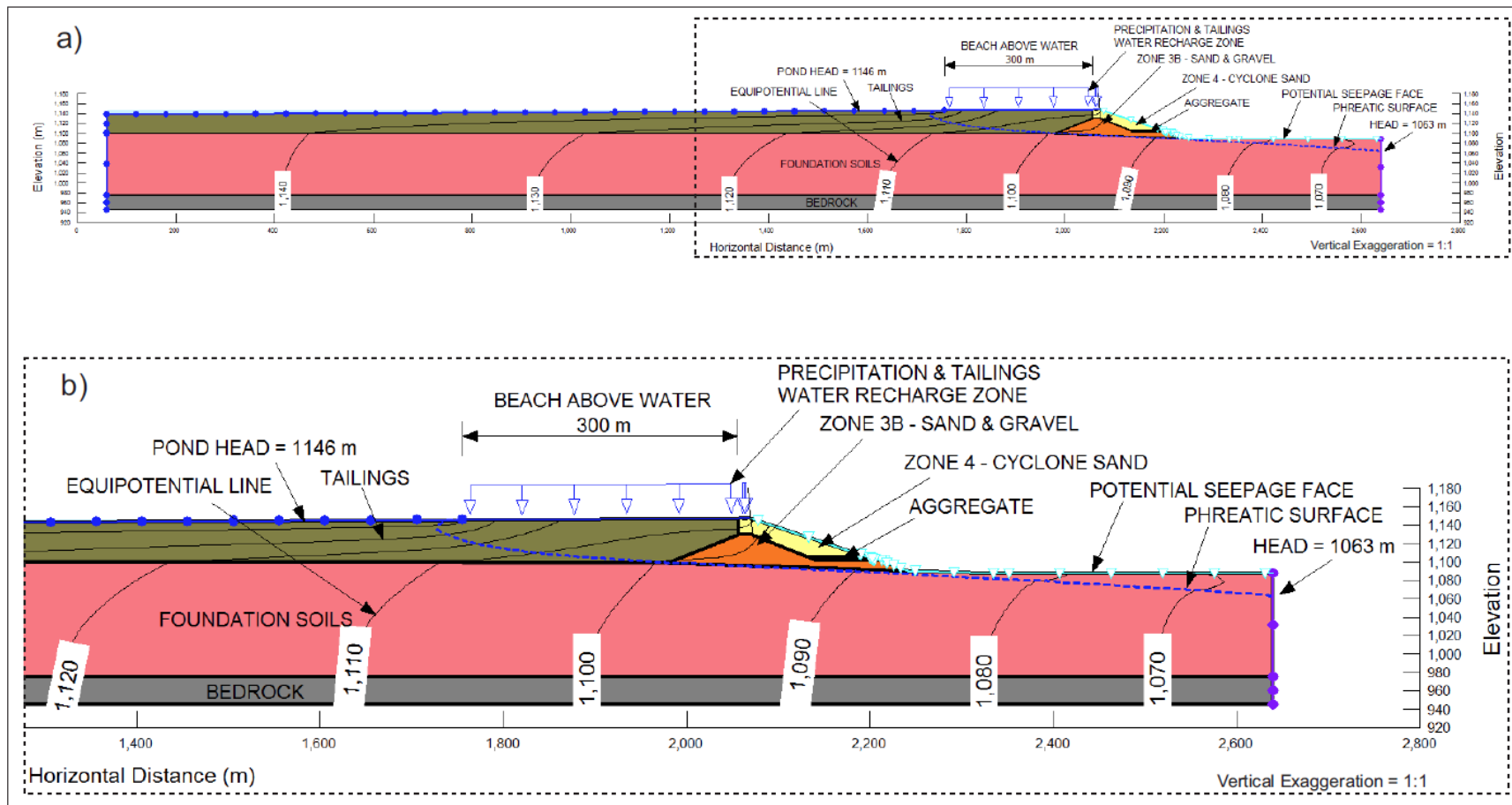


Figure 3. Seep/W Model Snapshot Sand Dam: Year 10 a) section through the South Tailings Impoundment Area (TIA); b) section through the dam and its foundation.

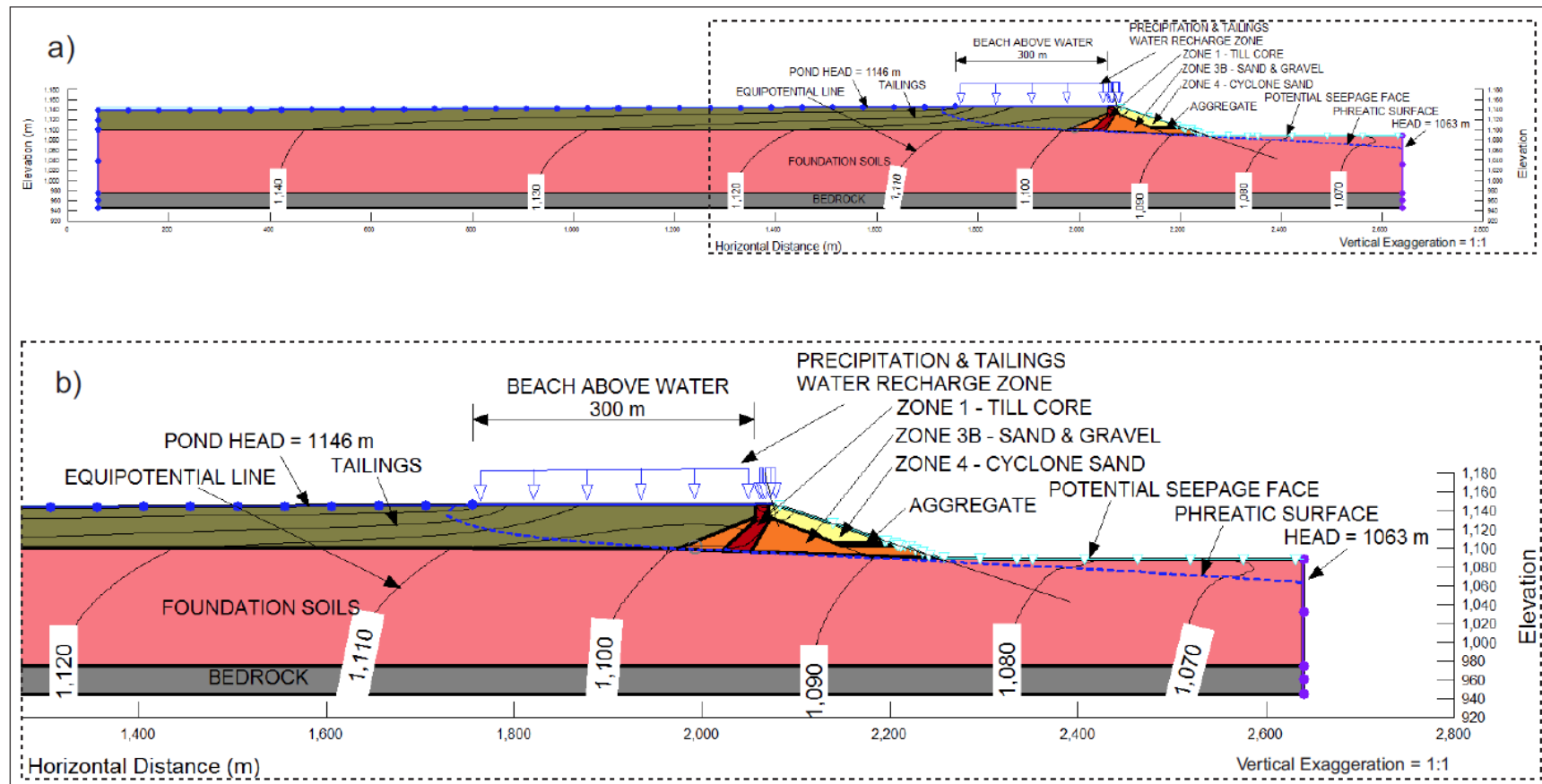


Figure 4. Seep/W Model Snapshot Till Core Dam: Year 10 a) section through the South Tailings Impoundment Area (TIA); b) section through the dam and its foundation.

‘The core zones for each dam will be tied into the native foundation till blanket; effectively cutting off seepage flows through the high hydraulic conductivity sands and gravels comprising the upper aquifer.’

The absence of the native foundation till blanket beneath the SD precludes this component of the commitment from being achieved.

Tailings discharge from the SD during the initial start-up phase will result in tailings process water that will be in direct contact with the foundation soils upstream of the SD. RCDC, following Best Management Practice (BMP), has committed to the following actions as seepage reduction measures:

- The presence of this tailings blanket will reduce the amount of seepage entering the foundation. Tailings deposition modeling (using Muck3D software) shows that after approximately 2 months of active deposition, of the full Non-Acid Generating (NAG) tailings stream from the SD, the tailings blanket would extend to Black Lake approximately 1300 m upstream of the SD. After 6 months the tailings will have reached the Temporary Saddle Dam. The predicted tailings extents are shown on Figure 5.

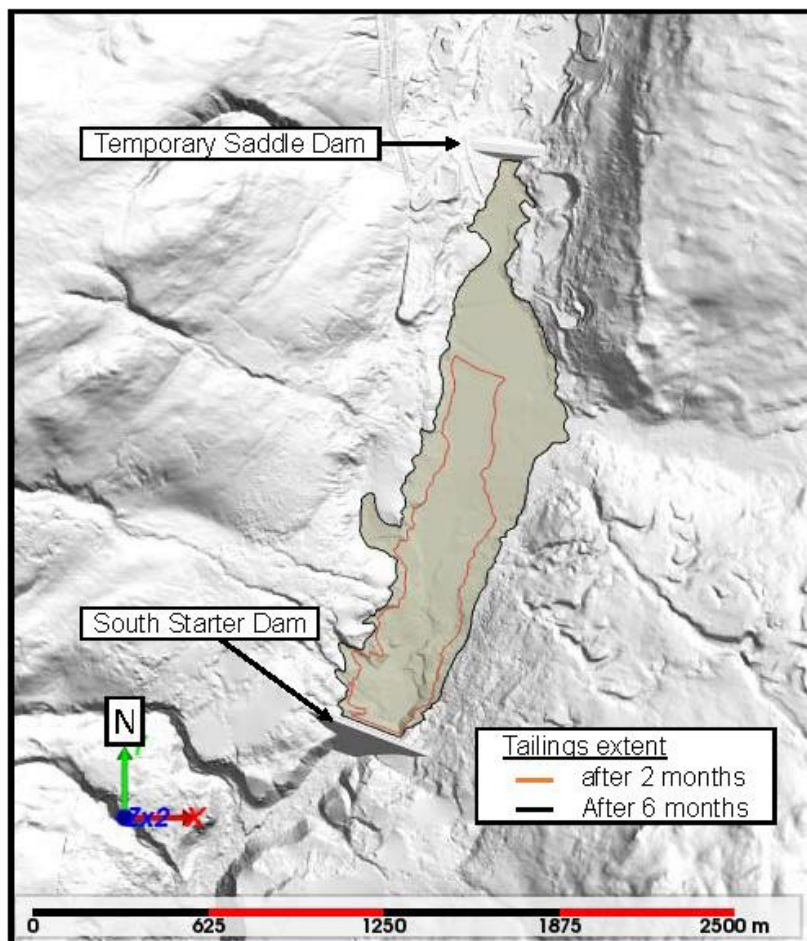


Figure 5. Extent of Tailings after 2 and 6 Months of Tailings Deposition.

- RCDC will install temporary surface water pumps in front of the developing beach and as the beach extends to the north, the temporary pump locations will also be moved north. Intercepted water will be pumped to the north impoundment. This measure will serve to reduce the size of the free water pond (the amount of tailings transport water available to seep into the foundation) as the tailings beach develops. At this stage of the facility development, RCDC will be operating in water deficit and the tailings water pumped from the south will be required to maintain water levels at the barge in the north basin to supply reclaim water for mill operations.
- RCDC will preserve the natural cover over the more pervious subsurface sand and gravels. As shown in Figure 6 (October 2015 drone flyover imported into Google Earth), the area upstream of the South Dam is largely undisturbed and evidence of perched water (creeks and ponds) is indicative of a ground surface of relatively low hydraulic conductivity. The presence of this natural soil cover will serve to restrict seepage into the foundation. In borrow areas where the natural cover has been reduced or removed and sand and gravel has been exposed, RCDC will mechanically place tailings or waste till (or other suitable fine grained material) to act as a seepage reduction measure until the tailings are deposited over the area.

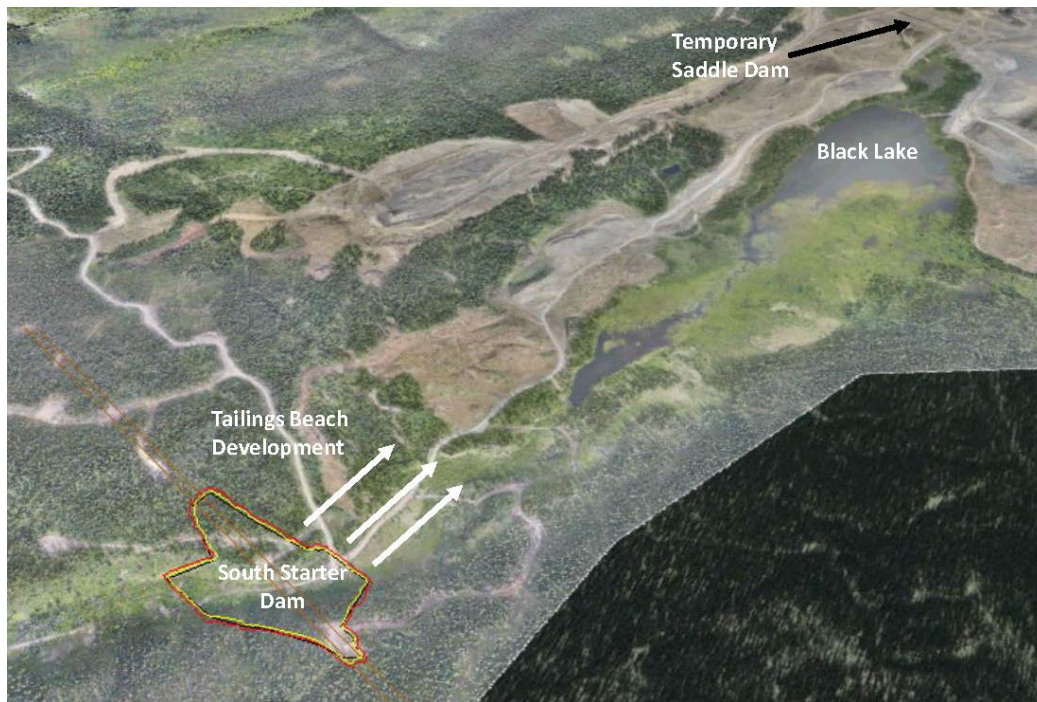


Figure 6. South Starter Dam Upstream Area (October 2015).

- Design of a seepage recovery system (groundwater recovery wells) downstream of the SD to intercept and recover part of the subsurface seepage flow. The seepage recovery plan will be developed based on the findings of the on-going groundwater modeling work and proposed additional pumping test(s).

RCDC is committed to following the above noted measures to reduce seepage from the TIA.

‘The tailings discharged into the impoundment will, once the impoundment is well developed beyond the first few years of operation, serve to limit the rate of seepage through the foundation soils. This will be of particular benefit in any areas where the natural glacial till blanket is discontinuous and there is direct communication between the upper and lower aquifers.’

The commitments outlined above are the basis for the operational plan. Tailings will blanket the impoundment and serve to reduce the rate of seepage into the foundation.

‘There may be a need for a deep seepage cut-off to prevent the development of unacceptably high seepage pressures in the lower aquifer.’

The absence of a continuous till blanket makes the development of unacceptably high seepage pressures in a lower aquifer unlikely. Vibrating wire piezometers have been installed into the foundation and seepage pressures will be monitored. Downstream pumping wells have been installed and could be used to depressurize the foundation if this unlikely condition was to develop.

4.0 BEST AVAILABLE TECHNOLOGY DISCUSSION

Examples of Best Available Technologies (BAT) for tailings storage presented by the Mt. Polley Independent Review Panel are discussed below with the BAT in bold and BGC commentary in italics:

1. Eliminate surface water from the impoundment

- a. Elimination of surface water from the impoundment is not practicable as a surface pond is required to maintain the PAG tailings submerged (PAG tailings are to be deposited into the central portion of the impoundment). The above water beach requirement dictates that the pond size is actively managed and kept well away from the dams.

2. Promote unsaturated conditions in the tailings with drainage provisions

- a. The above water beach in conjunction with the effective natural drainage provided by the foundation sand and gravels will maintain the dam and tailings immediately upstream of the dam in a drained condition and provides for a low phreatic level located below the dam.

3. Achieve dilatant conditions throughout the tailings deposit by compaction

- a. Effective downward drainage through the tailings and the loading provided by the actively developing beach above water will both contribute to increasing the density of the tailings immediately upstream of the dam.

The Mt. Polley Panel recommended Quantitative Performance Objectives (QPOs) be developed for tailings impoundments. The relevant QPO for the Red Chris TIA is a minimum beach above water length in front of the South Dam. The development of this length of beach as quickly as possible and then maintaining it during operations are needed for the safe operation of a sand dam.

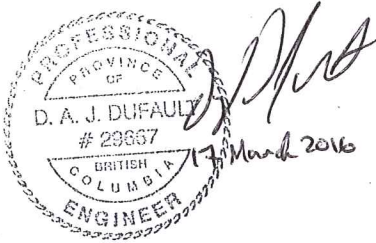
5.0 CLOSURE

BGC Engineering Inc. (BGC) prepared this document for the account of Red Chris Development Company Ltd.. The material in it reflects the judgment of BGC staff in light of the information available to BGC at the time of document preparation. Any use which a third party makes of this document or any reliance on decisions to be based on it is the responsibility of such third parties. BGC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this document.

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Yours sincerely,

BGC ENGINEERING INC.
per:



Daryl Dufault, P.Eng.
Senior Geotechnical Engineer

Clint Logue, P.Eng., P.Geo.
Principal Geotechnical Engineer

DD/TH/ej/pg

Copies: Raj Anand

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APPENDIX B

LETTER TO THE HONOURABLE BILL BENNETT



UNIVERSITY OF BRITISH COLUMBIA

NORMAN B. KEEVIL Institute of Mining Engineering

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Honourable Bill Bennett
Minister of Energy and Mines
PO BOX 9060, STN PROV GOVT
Victoria, BC V8W9E2

August 18, 2015

Dear Minister Bennett,

I have observed with interest the public dialogue around tailings management options following the Mount Polley tailings storage facility failure and would like to take this opportunity to provide you with some of my thoughts with respect to tailings management facility (TMF) design related to best available technology (BAT).

The Independent Expert Engineering Investigation and Review Panel identified three components to accomplish BAT and listed filtered tailings ("dry stack"), underground backfill and mined out pits as examples of potential management options.

The geology, topography and climate of British Columbia are diverse and varied. Considerations for selecting a tailings management option requires site specific measures to result in a stable and resilient tailings deposit; one size does not fit all. Structural integrity must be the number one priority of the design and management of every TMF.

Following the release of the Panel report, the Panel met in Prince George on March 20, 2015, as part of a discussion on tailings management involving government, First Nations and industry. There was further discussion about this topic, specifically risk management practices, including redundancies in design. It was emphasized that, like most technologies, there are variations for site specific tailings management that could satisfy BAT and there are opportunities for industry to explore new innovations with respect to tailings management.

In my opinion, BAT is not a single technology; its selection is based on a site-specific risk management process with the outcome of a stable and resilient tailings deposit. Thank you for the opportunity to provide you with my thoughts. Should you be interested, I would be pleased to discuss these ideas with you further.

Sincerely,

A handwritten signature in black ink that reads 'Dirk van Zyl'.

Dirk van Zyl, Ph.D., P.Eng.
Professor, Chair of Mining and the Environment

APPENDIX C

SUMMARY OF TAILINGS TECHNOLOGIES

C.1. INTRODUCTION

Tailings can be discharged from the plant site at a variety of slurry densities (percent solids by weight). The slurry densities vary from an unthickened tailings (or conventional slurry) with about 20 to 30% solids by weight, through a tailings stream thickened in conventional thickeners normally located near the plant (30 to 50%) to a paste tailings with a slurry density of 50 to 70% (high slurry density thickeners) and eventually to a filtered dry tailings with a slurry density of 70% to 85% by weight (filter belts, disc filters and hydraulic operated filter presses). This entire range of processes should be viewed as a continuum that varies from a high to a low liquid content. Table 4-1 summarizes four current tailings disposal technologies, which are generally considered for facilities. Each of these technologies is described in detail below.

Table C.1-1 Tailings Disposal Methods

Tailings Technologies	Disposal	Typical Tailings Slurry densities (% solids by weight)	Description
Unthickened Tailings (or conventional slurry)		20 to 30%	• Unthickened hydraulic deposition • Highest % of water
Thickened Tailings (medium density slurry)		30 to 50%	• Thickener used to decrease the amount of water
Paste Tailings (high density slurry)		50 to 70%	• High density thickeners are used to create a paste
Filtered Dry Tailings		70 to 85%	• Mechanically filtered • Lowest % of water

Co-mingling is another tailings disposal technology that can be considered. Co-mingling as proposed by Wickland and Wilson (2005) involves placing saturated tailings into the voids of waste rock to inhibit oxidation and prevent or mitigate the onset of acid rock drainage. As the waste rock is not deposited into the TSF, comingling does not present an advantage for tailings management for this project.

C.2. UNTHICKENED TAILINGS (CONVENTIONAL SLURRY)

On the wet end of the spectrum, conventional unthickened tailings are delivered to the pond hydraulically, and are deposited to form beaches that contain a pool that is usually pushed away from an earth or rock fill dam. Beach lengths can vary to store excess water in some environments. Unthickened tailings deposited hydraulically are prone to segregation so that a

coarser, free draining material forms the beach and the slimes are carried to the central part of the basin. The coarser material drains well so that stable beaches are created and the slimes form a low permeability plug in the central part of the basin that helps to reduce (although not eliminate) seepage in the foundation.

Transport water from the process is accumulated in the pond or is trapped in the tailings voids. Water is reclaimed from the facility after the solids have settled and the water is pumped back to the mill for reuse in processing. The containment structure is constructed from borrow or the coarser sand fraction from the tailings and this is built higher than the pond with an adequate freeboard to allow containment of storm events. In areas where seismicity is high, upstream construction is not possible and tailings may have to be segregated by beaching then farmed and placed as borrow with significant applied compaction. Alternatively, direct placement of the coarse sands after passing through a hydro-cyclone followed by compaction and construction of adequate underdrains has proven to be an economic practical solution in many areas and has become a standard method of building containment.

Placement of the sand on the beaches can be accomplished by open end discharge, spigots or spray bars. Full flow from an open end discharge is generally turbulent and solids stay in suspension for longer distances from the discharge point. Beaches are consequently flatter as the coarser tailings are carried further into the pond. The use of spigots reduces the flow velocity and will slightly increase the beach slopes and allows the water to clarify faster than with turbulent flow. The spray bar has a very low flow that allows water to clarify rapidly, and promotes increased water loss through evaporation, but the method is manpower intensive and requires constant monitoring to alter the spray bar location, and to ensure that the spray bars do not become plugged.

The initial settled slurry density of the tailings is a function of the specific gravity of the material, mineralogy (particularly the clay content), and the presence of additives such as hydroxide sludges from autoclave or acid rock drainage treatment plants. Although minor changes in the initial slurry density appear to be influenced by the disposal method, the terminal settled slurry densities do not appear to vary with the deposition methods, and are much more susceptible to chemical changes or the presence of clay in the ore.

C.3. THICKENED TAILINGS

In areas where water is at a premium and evaporation losses from the pond could be high, water can be removed from the tailings using a thickener that, with the aid of mechanical rakes and addition of flocculants, increases the percent solids in the slurry and removes excess water. Even if water is not at a premium, thickening serves to remove water from the tailings stream at the mill where it is recycled without having to be pumped to and from the tailings pond and is typically cited as the main advantage of tailings thickening.

Thickening results in a denser slurry that exhibits a lower amount of segregation when deposited on a beach. This may be useful if drainage is not required or desired at the dam.

As the amount of water is decreased by further thickening, the density of the slurry discharged in the tailings facility increases. As the slurry density increases, the degree of separation and segregation of the fine and coarse tailings is reduced. Generally conventional centrifugal pumps are still used to discharge the tailings and a water pond is still required at the containment facility, albeit one potentially reduced in size. Clays in the tailings may reduce the efficiency of the thickeners.

C.4. PASTE TAILINGS

Further still along the wet-dry spectrum, high density thickeners can be used to create a paste. A paste disposal system also has the advantage of maximizing water retention at the plant and usually only retains enough moisture in the product so that it can be pumped using high slurry density positive displacement pumps.

Paste tailings tend to form steeper beaches than conventional beaches which, with a central tailings discharge point, has an advantage requiring a lower dyke for perimeter containment and hence lower costs of dam construction. The paste tailings does not segregate and reaches a terminal slurry density sooner than conventional tailings. However, the terminal slurry density does not appear to be significantly greater than that derived from a conventional tailings, although a benefit can likely be realized in the first few months and even years of placement. Moisture contents in the saturated beaches after placement are reported to be similar when comparing conventional vs. paste (Blight 2003).

If the climate is dry, desiccated tailings can be built up. It is important to note that in a wet climate the paste impoundment cannot contain runoff and water containment ponds are needed. A commonly cited advantage of thickened paste tailings deposits is the possibility of building a steeper beach so that a low containment dyke can be built to contain a steeper cone of paste. In dry, aseismic areas, this is considered possible. However, experience in Canada and Tanzania suggest that in areas of high precipitation or large spring runoffs, large external ponds are required to contain contaminated waters that is normally contained within a conventional pond and the benefit is suddenly and unexpectedly lost. In addition, the tailings are subject to re-saturation and flow, or erosion following precipitation or runoff, so beach slopes are usually less than expected.

C.5. FILTERED TAILINGS

On the driest end of the spectrum, a filter cake can be produced that can be mechanically placed and compacted and then stacked. Filtered tailings is considered to be practical only in a dry climate (although these are being used for small mines in wet zones in Alaska and Peru) and are capital and operator intensive.

Filter cake systems are maintenance intensive and do not operate 100% of the time. This requires redundancy in the process at a substantial cost and therefore some smaller conventional tailings containment facility is generally still required as a backup. Placement of filtered tailings in a rainy environment is challenging and the tailings often re-saturates before compaction. This often leads to the need for two facilities, a permanent (or main) waste storage site and a temporary off-site

pile. When the rains stop, tailings in the temporary pile is trucked to the main site for permanent disposal.

A number of dry stack operations have been successfully built and operated throughout the world. The dry stack has been successful in very dry areas and has been somewhat successful in slightly wetter areas. Very wet areas do not appear to be conducive to dry stacking. The dried tails re-saturate quickly and are then difficult to compact. Some operations in Alaska use compacted tails used to build containment cells during dry weather and fill behind these cell walls with uncompacted tails in wet weather. Some have membrane lined cells. Filtered tailings are often associated with relatively low throughput (1,000 to 3,000 tonnes per day) underground mines where paste backfilling of the underground is part of the mine plan.

C.6. HYDRO-CYCLONING

Hydrocyclones (cyclones) are used to classify (separate) slurried tailings into a coarse, free-draining sandy underflow (Cyclone Underflow Tailings) and a low density, fines-rich cyclone overflow (Cyclone Overflow Tailings). The underflow may be beached, used as a construction material for embankment construction or stacked separately.

There is ample precedent for cycloned sand construction for tailings dams in British Columbia and world-wide. Four of the largest tailings dams in the province, the L-L Dam at Highland Valley Copper, and the Gibraltar, Brenda and Copper Mountain (Similco) tailings dams, are constructed mainly or entirely of cycloned sand.

Key factors in assessing the suitability of tailings for cycloning are the amount of clay in the tailings and the potential for acid generation in the cyclone underflow used for dam construction.

C.7. FREEZING COMPLICATIONS

In freezing conditions, paste and filtered tailings require additional considerations. Filters must be contained in a heated building and trucks used to deliver the tailings to the site require heated boxes to prevent freezing to the sides of the containers. The tailings have to be compacted before they freeze as the even the lower moisture content of 20% can prevent densification to required standards.

Conventional tailings disposal of course in freezing conditions also has problems particularly in lined impoundments. Freezing sheets on the pond can rip liners. The latent heat present in slurried tailings allows tailings to flow, but even so large deposits of ice may form in beaches that take up volume and disrupt drainage paths and prevent terminal slurry densities from being achieved. Without the high moisture content supplying a significant latent heat of water in a paste tailings, it is not clear how far a paste tailings will flow in cold winters or what beach slopes will be achieved initially, and then later when ice melts. Paste has been proposed and is actually being built at some sites in Canada but operations have yet to report on and confirm their success.

C.8. SUBAQUEOUS DEPOSITION

Subaqueous deposition of tailings has proven to be the most practical method of reducing ARD generation to acceptable levels by minimizing and reducing direct oxygen contact with the tailings (MEND, 2001). This method of deposition is more easily achieved when the tailings are placed behind a dam in a concave beach and flooded. In dry areas where tailings is stacked, ARD is not prevented; however the amount of water seepage is generally so low that mobility of the byproducts from the reaction is not a concern.