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March 19, 2007

Tsolum River Partnership c/o Pacific Salmon Foundation Suite 300, 1682 West 7<sup>th</sup> Avenue Vancouver BC V6J 4S6

# Attention: Dianne Ramage

Dear Dianne,

# Re: Mount Washington ARD Remediation Plan – Phase II

# 1. Introduction

This letter presents SRK's response to a request for proposal for Phase II of the Remediation for the Mount Washington Acid Rock Drainage problem . Phase II will involve the development of a detailed remediation plan of the mine site based on the outcome of the Phase I Study. The scope of the work for Phase II would involve:

- Designing the elements of the preferred option or combination of options including final design drawings, preparation of tender documents, estimates of material quantities; and
- An engineering cost estimate of the capital, labour, monitoring and maintenance requirements for implementing the remediation plan.
- Preparing a draft and final remediation plan report for submittal to the project manager.
- Meeting with the Steering Committee to present the final report and preferred option as well as plan for Phase II.

As discussed in the Phase I report, the preferred remediation option would include a cover over the entire pit area to reduce the loading by at least 90 percent of the current load from the site. The function of the cover would be to separate clean runoff water from the contaminated water, reduce infiltration, allow revegetation and provide marmot habitat. Options for the cover that would be evaluated in Phase II would include till only, a bituminous liner plus till or an asphalt impregnated geotextile plus till.

Surface diversions would also be considered as part of the overall plan. The diversions being considered include improvements to the existing uphill diversion above the pit, surface runoff diversion channels on the pit cover and a possible diversion around the Branch 126 wetland. The design would also include an Proposal.1CD003.065.DH.20050310



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underdrain seepage collection system below the liner that would direct the contaminated seepage to a new sump located at the low point of the cover. An HDPE pipeline would convey this contaminated seepage to a new temporary water treatment system that would be located at either Branch 126 or Pyrrhotite Lake.

Short- term treatment system for the mine site water would likely be by lime addition located at either Branch 126 or Pyrrhotite Lake. SRK would also consider construction of berms in Branch 126 wetland area. One idea is to construct a berm at the eastern end of the wetland to raise the water level and one at the midpoint to segment the reservoir. The treatment would continue to rely on Pyrrhotite Lake and Spectacle Lake wetland as polishing ponds. It is believed that it could take between 5 to 10 years for the new pit cover to reach optimum efficiency. In the meantime, short term water treatment would be implemented.

A monitoring and maintenance program would be developed to monitor the improvement of the water quality both in Pyrrhotite Creek and the Tsolum River. Additional work that would be needed prior to implementing the construction program would include monitoring of this years 2007 freshet, treatability tests, identification of till and gravel borrow sources.

The following section presents a description of activities that SRK expects to carry out as well as an estimate of our fees and disbursements.

# 2. Proposed Scope of Work

## Task 1. Site Investigation

This task will involve a field investigation to identify potential borrow areas for cover and growth medium material. The work would require an initial site reconnaissance by a geotechnical engineer of a number of sites. Once potential sites are identified, test pits would be excavated with a track-mounted backhoe at selected sites and samples would be collected of the soil profiles. The samples would be returned to a soil laboratory for moisture content determination, gradation analyses, compaction testing and permeability tests.

The site reconnaissance would also include a traverse down Pyrrhotite Creek along the possible alignment of the pipeline.

#### Task 2. Freshet Monitoring

In order to develop the final cover design and details of the underdrain system, it is believed that flow and water chemistry data should be collected from key locations in the pit area during this years (2007) freshet. Flow data at the four existing weirs would be recorded and water quality samples would collected both at the weirs and at key seep locations.

#### Task 3. Ground Survey

This task would involve a review of available topographic maps including the large scale maps that were developed during the 1989 work on site. However, it is expected that a detailed ground survey of the pit area would be required in addition to acquiring the available maps. A 1 m contour map of the pit area would be generated from the survey data.

#### Task 4. Water Chemistry

This task would involve input into designing the water quality sampling program and interpretation of the results. Water chemistry input to the evaluation of the effectiveness of the different cover options would be included under this task.

## Task 5. Hydrological and Hydrogeological Analysis

A hydrological and groundwater analyses of the mine site would be required to evaluate the effectiveness of the cover options, the design of the underdrain system and the hydraulic design of the pipeline to the water treatment system.

## Task 6 Design

## Task 6a Pit Cover and Underdrain

As discussed above, this task would involve the evaluation of a number of different cover options for the pit cover. A preferred alternative would be selected and a detailed engineering design prepared. Quantities would be calculated and an engineering cost prepared.

This task would also cover the design of the seepage collection system beneath the liner, the sump and the surface drainage on the cover. Design considerations would include the requirement to revegetate the site and to encourage the return of the marmot community.

#### Task 6b Diversion Pipeline

SRK would design a pipeline from the sump to a water treatment system either at Pyrrhotite Lake or Branch 126. The design would consider the need for anchoring, freezing potential, avalanche potential, snow load, hydraulic pressures.

#### Task 6c Water Treatment

SRK will consider alternative methods for the short-term treatment of flow in Pyrrhotite Creek based on the following criteria :

- The mine site is remote with limited access;
- No power readily available;
- Treatment methods and monitoring is performed by volunteers;
- Unmanned treatment system with occasional inspections;
- Dry hydrated lime to be introduced directly into Pyrrhotite Creek; and
- Spectacle wetlands to provide retention time to allow for settling of treatment sediments formed.

As direct in- stream application of dry hydrated lime is not a conventional method for conditioning of mine water, there are portable packaged units available for remote sites where access and limited or no power is available.

It is expected that field tests would be required to determine the reliability and optimization of lime addition to the mine water and modifications required as determined by the results of field trials.

In addition to water treatment methods, low voltage remote monitoring data loggers and internet based real time data acquisition equipment is recommended given the site will be assumed unmanned.

The primary purpose of the data loggers would allow the user to identify potential problems as it pertains to lime addition into the creek. Suggested monitoring would be pH, flow rate and temperature as a minimum.

#### Task 7 Tender Document Preparation

Following approval of the remediation plan from the steering committee, SRK will prepare tender documents for construction. This would include a bid package with technical specifications, service agreements, bid schedules, change order forms, drawings and photographs. Invitations to bid would be sent out to a select group of contractors.

## Task 8. Project Management

The objective of this task would be to ensure that there is regular communication between the steering committee and SRK and to bring any problems or concerns to their immediate attention. The task would include meetings and teleconference calls. Monthly invoices and supporting documentation would also be prepared under this task.

SRK would also assist in the preparation of relevant permit applications, including a health and Safety plan.

# **Proposed Schedule**

SRK expects that the design phase, tender bid package issuance and contract award would be carried out in 2007. Construction would be in 2008.

## **Cost Estimate**

The estimated cost for the proposed work is \$160,000. Details of the estimate are provided in Table 1.

## Yours truly,

## SRK Consulting (Canada) Inc.

Peter Healey, P.Eng. Principal

# Table 1: Mt Washington Remediation - Phase II (Final Design) Estimate Estimate of Professional Fees and Disbursements

Task No	Description	Professional Time (hrs)									Subtotal	Disbursements								Total
		PMH	SD	CE	DH	PJB	Staff Eng	MR	Draft	WP	Cost	Travel	Grd Surv	Lab Anal	Site Inv	Exp.	Copies	Comm.	Cost	Cost
1	Site Investigation	8					40				\$6,320	\$1,000			\$8,000	\$500		\$190	\$9,690	\$16,010
2	Freshet Monitoring	8	8				40				\$7,880	\$1,000		\$2,000		\$1,000		\$236	\$4,236	\$12,116
3	Ground survey	8					40				\$6,320		\$10,000					\$190	\$10,190	\$16,510
4	Water Chemistry		40								\$7,800							\$234	\$234	\$8,034
5	Hydrological Analysis					80					\$6,800							\$204	\$204	\$7,004
6	Design																			
6.1	Pit Cover and Underdrain	8	20		8	24	60	24	60		\$25,460							\$764	\$764	\$26,224
6.2	Diversion Pipelines	8				40	40		40		\$13,320							\$400	\$400	\$13,720
6.3	Water Treatment			80	40		40				\$27,800							\$834	\$834	\$28,634
7	Tender Document Preparation	24			8		60		32	24	\$18,000						500	\$540	\$1,040	\$19,040
8	Project management	60									\$11,400							\$342	\$342	\$11,742
	Subtotal hrs	124	68	80	56	144	320	24	132	24	972									
	Rate (\$/hr)	\$190	\$195	\$175	\$225	\$85	\$120	\$150	\$90	\$65										
	Subtotal cost	\$23,560	\$13,260	\$14,000	\$12,600	\$12,240	\$38,400	\$3,600	\$11,880	\$1,560	\$131,100	\$2,000	\$10,000	\$2,000	\$8,000	\$1,500	\$500	\$3,933	\$27,933	\$159,033

P. Healey PMH Steve Day PM Pat Bryan PJB Staff Engineer Staff Eng Daryl Hockley DEH AutoCad DRFT Word Processing WP Maritz Rykaart MR Chemical Engineer CE