McElhanney

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TAHLTAN HIGHLAND ROUTE

In the study of alternate access routes to the Schaft Creek site, four routes were reviewed (Mess Creek, Raspberry Pass, Artic Creek and Ball Creek). The preferred route was the Mess Creek Route as this route provided an access that had reasonable grades, minimal environmental impacts and did not impact Mount Edziza Park.

A fifth alternative route (Tahltan Highland Route) was presented to Copper Fox by another party; during meetings discussing the route selection. This route accessed the Artic Lake Plateau from the Galore Creek Road at approximately km59, travels along the plateau through Mount Edziza Park, then returning to Mess Creek north of Artic Creek.

This route was modified to avoid crossing through Mount Edziza Park. A scoping level design utilizing trim data was developed and the drawings are presented in Appendix B; the Mess Creek Route drawings are presented in Appendix A.

The Tahltan Highland Route was proposed to provide the following advantages:

- Avoid the avalanche areas of the Mess Creek Route
- Reduce the possibility of encountering archaeological sites
- Reduce the possible impact on fisheries habitat.

Items of concern for this route are:

- Arctic Lake Plateau is a relatively flat barren expanse, which is highly exposed due to minimal vegetation.
- The road leaves the Galore Creek Road at an elevation of 1045m and rises to 1530m on the Arctic Lake Plateau before dropping back down to Mess Creek at an elevation of 830m.
- The Tahltan Highland Route would involve an additional 4km of construction compared to the Mess Creek Route.
- Winter operating conditions will be difficult due to the high elevation and openness of the terrain along the plateau.
- The possibility of closing this route due to safety concerns will be increased over the route through the valley.
- The requirement for four switchbacks within a 3km section of the road. Reducing the grades to 8% or less, which is the recommend maximum for switch back areas, would require one or two additional switchbacks.

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Route Description

The Tahltan Highland Route alternative leaves the Galore Creek Access Road at approximately km 59 climbing up to the Tahltan Highlands then along the Highlands for 3.2km before rising up to the Arctic Lake Plateau. The route traverses the Plateau along the west side of Artic Lake then begins to drop in elevation before switch backing down to Mess Creek and joining the current alignment at km 26.2.

A comparison of the two routes is shown in Table 1 and an additional description of the Tahltan Highland is presented in Table 2.

Table 1 Route Comparisons

	Tahltan Highland	Mess Creek	Difference
Elevation of Galore Creek Road connector (ASL)	1045m	1055m	10m
Elevation of Height Of Land (ASL)	1510m	1075m	435m
Elevation of Mess Creek @ station 26.2km (ASL)	830m	830m	0m
Elevation rise	465m	20m	445m
Elevation drop	680m	245m	435m
Distance on Galore road	59km	65.1	-6.1
New construction	43.6km	39.6km	4km
Total distance	102.6km	104.7km	-2.1km

Table 1 Tahltan Highland Route Summary

SECTION	KM	DESCRIPTION	ELEVATION Min (m)	ELEVATION Max	GRADES (%)	AVERAGE GRADE (%)
More Creek to Tahltan Highlands	0-2.9	• Additional design work should be able to refine the maximum grades to ≤10% • No major stream crossings. • 160m elevation gain	1045	1205	-4 to +12	+5.5
Along the Tahltan Highlands	2.9-6.1	• 6 stream crossing (1 major) • Gentle grades	1200	1245	-3 to +8	+0.5
Climbing to the Arctic Lake Plateau	6.1-12.9	• Open area (alpine) • 10 stream crossing (no major crossings) • 300m elevation gain	1210	1520	0 to +8	+4.6
Arctic Lake Plateau	12.9-17.9	• No apparent stream crossings • Flat alpine area subject to high winds and blinding snow in the winter • Gentle grades	1495	1530	-4 to +7	0
Dropping down from the Plateau	17.9-24	• At 19 ½km leaves the open plateau • 17 stream crossings (possibly 4 major) • May be a marshy area • 300m elevation drop	1230	1530	-16 to +3	-4.6
Switch backs down to Mess Creek at km 26.2	24-30	• 12 steam crossings (with the switchbacks; the same creek is crossed five times) • 4 switchbacks (an additional one or two switchbacks would be required to maintain the grades below 8%) • 24km to 26km possible avalanche area (side slopes >50%) • 400m elevation drop	830	1230	-12 to +4	-6.7

Plans and sections showing the route alignments are attached in Appendix A (Mess Creek Route) and Appendix B (Tahltan Highland Route). Some additional comments regarding the two routes are included as Appendix C.

The Mess Creek route continues to be the preferred route of choice to provide a safe and efficient access to the Schaft Creek project with minimal environmental impacts. The revised route that travels along the west side of the Mess Creek valley and joins the initial alignment at Artic Creek avoids the major avalanche areas that are present along the east side of the valley.

We trust that this information will assist you in your evaluation of the routes. If there is additional information that you may require please contact us.

Yours truly

David Pow, P.Eng.

Appendix A; Mess Creek Route

Appendix B Tahltan Highland Route

Appendix C ADDITIONAL COMMENTS

These items concern the portion of the route that is different only.

	Tahltan Highland Route	Mess Creek Route
PROS	• Shorter overall distance from highway to minesite • Avoids approximately 20km of valley bottom • Little possibility of fisheries habitat at the higher levels • Reduces the chance of encountering Arch sites	• Minimal elevation gain • Within the valley except for the initial portion of the road • Grades are 10% or less • Less road construction required than Tahltan route
CONS	• An additional 4km of road construction required • May pose maintenance and operational problems due to exposure and elevation • Switch backs required to return to the valley bottom • Much greater elevation change over the route	• Avalanche areas are present • Fisheries habitat • Possibility of encountering Arch sites • Greater overall distance from minesite to Highway 37

FACTOR	TAHLTAN ROUTE	MESS CREEK ROUTE
Elevation	Elevation gain of 465m Maximum elevation of 1510m 21.6km above the 1200m elevation	Elevation gain of 20m Maximum elevation of 1080m
Grade	Currently max of 16% may be able to reduce to max of 10-12%	10% or less
Fisheries values	Low possibility of values over the length of the road	Fisheries values throughout the route
Archaeological values	Low possibility of values over the higher elevations of the road	Possibility of values over the length of the road
Length of road construction	30km	26km
Distance minesite to Highway 37	102.6km	104.7km
Maintenance and operational requirements	Higher requirements due to increase in grade and the high elevation Increased possibility of white outs and snow drifting Longer winter conditions	Moderate requirements Additional work in avalanche areas Duration of snow on road will be lower due to lower elevation