



1516 Robertson Ave.  
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## TECHNICAL MEMORANDUM

**Date:** January 28, 2019

**FILE:** SCL 18-1465

**To:** Jeff Reyden, R.P.F. & Sabrina Mutterer  
Woodlands Management Team  
Kaslo and District Community Forest Society  
P.O. Box 789  
Kaslo, B.C. V0G 1M0

**Subject:** Bjerkness Road – Drainage Control  
Bjerkness Creek, Kaslo, B.C.

### References:

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- GoogleEarth Imagery
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### INTRODUCTION

At the request of Mr. Jeff Reyden, R.P.F., manager for the Kaslo and District Community Forest Society (KDCFS), Sitkum Consulting Ltd. (SCL) has completed a drainage review of the Bjerkness Road which branches off the Kaslo Back Road. The area of concern is situated within the lower reaches of the Bjerkness Creek drainage in southeastern B.C., approximately 5 km south of the community of Kaslo (refer to Image 1).

The assessment was requested due to Bjerkness Creek breaching its main channel and diverting water onto the Bjerkness road and the Kaslo Back Road resulting in significant erosion of the road surface and sediment deposition.

The scope of the work, as agreed upon with Mr. Reyden, is:

- to determine the potential to mitigate the site where the Bjerkness Creek channel was breached; and
- to make recommendations to improve drainage control along the section of the Bjerkness road affected by the diverted flow.

### METHODS

The field assessment of the site was carried out by Mr. Marc Deschenes, Geotechnical and Avalanche specialist of SCL on September 7, 2018 accompanied by Mr. Jeff Reyden, R.P.F. and Ms Sabrina Mutterer of KDCFS. The weather at the time of the review consisted of mix of sun and clouds with temperatures between 20-25°C. Field positions were established based on using a Garmin CSX-60 hand-held GPS and recognizable land features (creeks, slope breaks, etc.).

## **SITE LOCATION - GENERAL**

Bjerkness Creek is a major drainage that drains a large area in the mountainous terrain located southwest of Kaslo. Bjerkness Creek is the domestic water supply to the community of Mirror Lake. The area of concern is located on the lower reaches of Bjerkness Creek where the creek flows out of a well incised gully onto the lower valley slopes characterized by undulating, bedrock controlled terrain. The lower reaches of the creek remains confined to a wider gully and meanders its way down to Mirror Lake, located approximately 2 km downstream (refer to Images 1 and 2). Given the size of the drainage area, the creek experiences significant high peak flows during spring freshet; Bjerkness Creek shows signs of recent historical debris flows (likely past few hundred years ). The lower valley slopes have a history of previous forest development.

The Bjerkness road begins from the junction with the Kaslo Back Road near the crossing of Bjerkness Creek. From the junction, the Bjerkness road extends approximately 200 m along the side of Bjerkness Creek before gaining elevation onto higher ground through harvested blocks.

## **SPECIFIC OBSERVATIONS**

1. Bjerkness Creek breached its main channel at a site located approximately 450 m upstream from the Kaslo Back Road (WP 93). The creek at this site remains confined in a broad gully, 6-7 m wide and the channel bedload consists mainly of boulders, cobbles and coarse woody debris. Channel gradients are 15-20% (refer to Image 3). A portion of the flow eroded through a lobe of what appears to be older debris flow deposits on the right bank resulting in a diversion of the flow into an older, adjacent flood channel confined in a shallow gully located immediately south of the main channel (refer to Images 4 and 5). The cause of the diversion is unknown, but suspect that re-mobilization of the bedload, including large boulders and woody debris, during the spring freshet of 2018 may have been a significant contributing factor. The 2018 snowpack and high stream peak flows recorded above average values.
2. The diverted flow remained confined in the shallow gully and flowed approximately 270 m where it became less confined and overflowed and crossed the Bjerkness road (WP 94, refer to Images 6 and 7). This resulted in a portion of the overflow to erode a narrow channel along the north side of the road, creating a ditch, and continued approximately 25 m where it diverted back towards the main Bjerkness Creek channel, located 20 m north (refer to Image 8). The remainder of the diverted flow crossed the road and flowed along the south side the road confined to a shallow swale.
3. The diverted flow confined in the swale alongside the road crossed the road a second time (WP 96) resulting in the flow to continue down the Bjerkness road, eroding the road surface and impacting the Kaslo Back Road located approximately 125 m down the road. This event was followed up by some maintenance and mitigation measures by the local public works which included installing a ditch at the crossing and re-surfacing the road with coarse free-draining material (refer to Image 9).

**INTERPRETATIONS**

1. The option of attempting to redirect the diverted flow into the main Bjerkness Creek at the site where the channel was breached is not recommended. The process would require manual labor and machinery which would be very labor intensive, expensive and hazardous. Given the size of the creek and the significant volumes of water flow during peak flows and the potential mobilization of the coarse bedload material, these types of natural events are likely to occur in the future. Therefore any attempts at modifying the creek channel may be very temporary.
2. The diverted flow is likely to continue its course in the future. Recommended mitigating the issue where the flow affects the Bjerkness road.

**RECOMMENDATIONS**

1. Option #1: Install 1000 mm culverts at both locations where the diverted flow crossed the Bjerkness road located at WP 94 and WP 96.
2. Option #2: At the site where the diverted flow first crosses the Bjerkness road (WP 94), widen and deepen the eroded channel that forms a ditch for 25 m length. The intent is to intercept the diverted flow prior to crossing the road, maintain the flow in the ditch and divert the flow back into the main channel.
3. WP 97: Install a cross ditch intended to divert any potential overflow off the road and back towards the main channel.

**CLOSURE**

The discussions and recommendations presented above are based on a visual site inspection and available background information. No further subsurface investigation was carried out as part of this assessment. This technical memorandum has been prepared for use by KDCF, which includes distribution as required for purposes for which it was commissioned. The assessment has been carried out in accordance with generally accepted geotechnical practice. Geotechnical judgement has been applied in developing the recommendations in this technical memorandum. No other warranty is made, either expressed or implied.

We trust that the information above meets your current requirements. If you have any questions, or require further information, please do not hesitate to contact the undersigned.

Respectfully submitted,  
**Sitkum Consulting Ltd.**

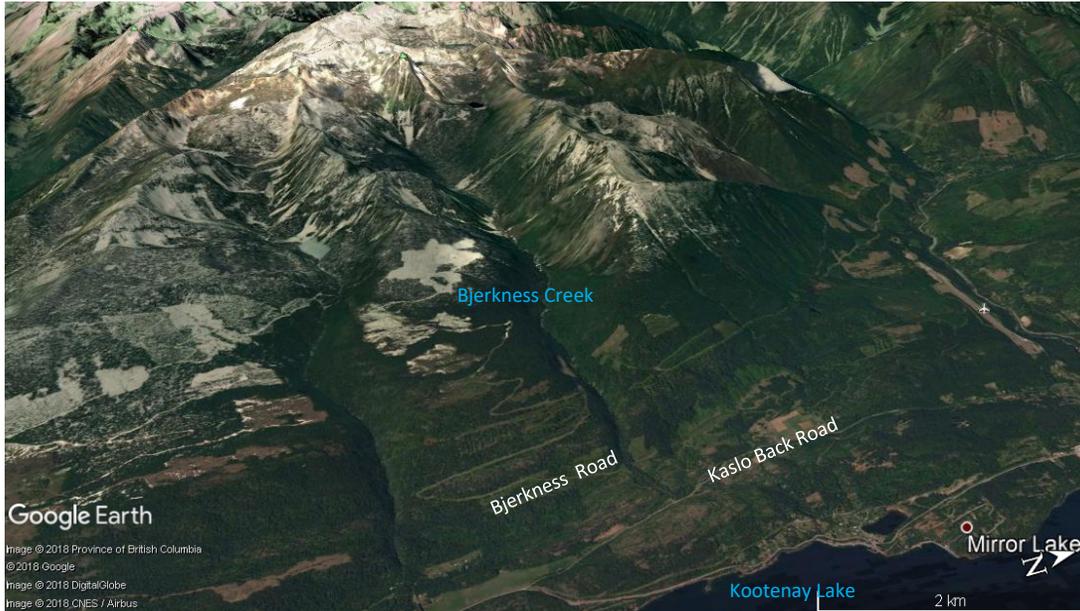
Prepared by:

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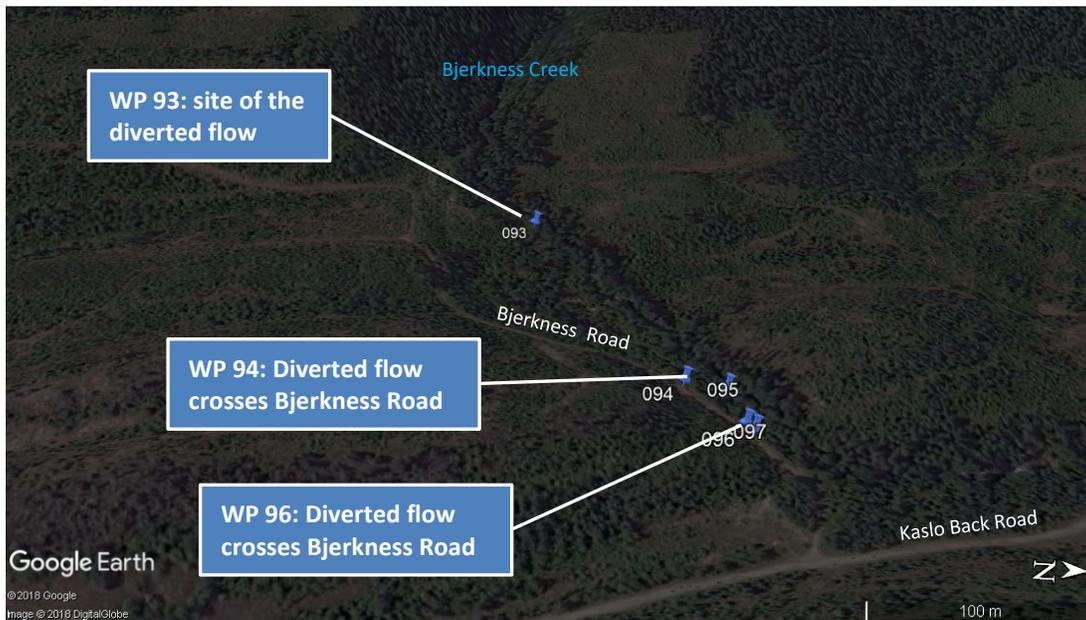
Marc Deschenes  
Geotechnical and Avalanche Specialist

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Engineering Geologist

### GE IMAGES AND SITE PHOTOGRAPHS – September 7, 2018



**Image 1:** Oblique aerial view using GE looking west at the Bjerkness drainage located above the Community of Mirror Lake.



**Image 2:** Oblique aerial view using GE looking west at the lower reaches of Bjerkness Creek showing the location of the diverted flow and the locations where it crossed the Bjerkness road.



**Image 3:** View looking upstream at the Bjerkness Creek channel and the coarse bedload (WP 93).



**Image 4:** View of the site where a portion of the Bjerkness Creek flow was diverted and eroded a channel through old debris flow deposits (WP 93).



**Image 5:** View looking down stream at diverted flow entering old flood channel contained in a shallow gully (WP 93).



**Image 6:** View looking up at the first location where the diverted flow crosses the Bjerkness road (WP 94).



**Image 7:** View looking down at the first location where the diverted flow crosses the Bjerkness road (WP 94).



**Image 8:** View of the eroded channel forming a ditch as a result of the diverted flow (WP 94).



**Image 9:** View looking down at the second location where the diverted flow crosses the Bjerkness road (WP 96). The image shows the repairs to the road following the diversion of the flow down the road towards the Kaslo Back Road.