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May 7, 2023

Regional District of Central Kootenay
Emergency Management Program

Attention: Stephane Coutu, Emergency Program Coordinator

Re: Unnamed Creek Little Slocan South Road Landslide

1. Introduction

At the request of Stephane Coutu, Emergency Program Coordinator of the Regional District of Central Kootenay (RDCK), and Michael Ferguson, RFT, Ministry of Forests, SNT Geotechnical Ltd. (SNTG) responded to an emergency request to assess a landslide that had occurred above the Little Slocan South Road on May 2, 2023, on an unnamed creek east of Talbot Creek (UCET Landslide). The purpose of the review was to advise the RDCK and MoF regarding the cause of the landslide, the potential for further imminent landslide activity, and the risk associated with local properties and residences.

On May 2, an Evacuation Order was issued by the RDCK for properties at:

- 3355 Little Slocan South Road
- 3360 Little Slocan South Road
- 3300 Little Slocan South Road

Evacuation alerts were issued for properties at:

- 3301 Little Slocan South Road
- 3290 Little Slocan South Road
- 3465 Little Slocan South Road
- 3279 Little Slocan South Road
- 3364 Little Slocan South Road

2. Site Location

The landslide deposit site is located approximately 5km northwest of Passmore at UTM 449300E, 5490450N. The location of the site is shown in Figure 1 below.

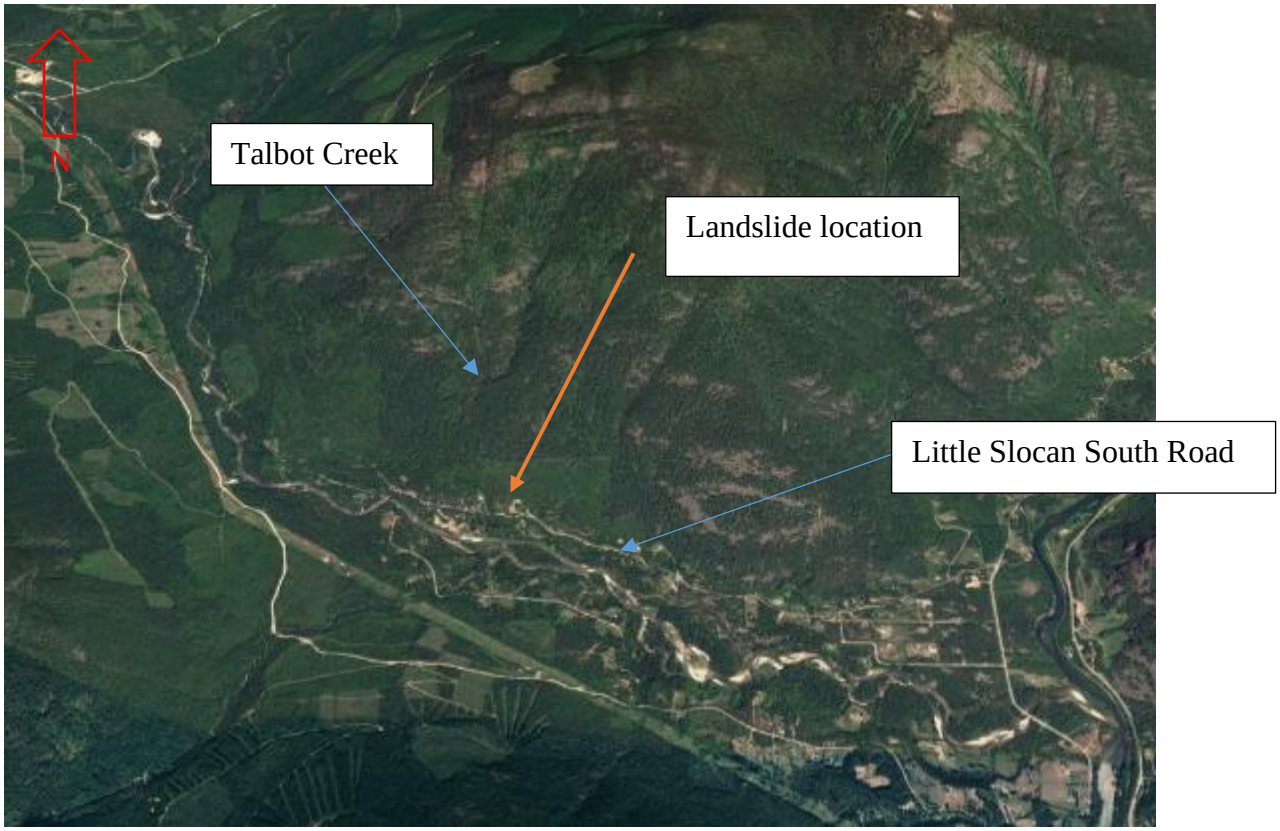

Figure 1 – Location of landslide (Google Earth Imagery circa 2020).

3. Field Review and Observations

SNTG was contacted by the Ministry of Forests and the RDCK during the evening of May 2, 2023, to request a geotechnical assessment of the landslide. Arrangements were made for a heli and ground review on the morning of May 3. A helicopter review was conducted by the undersigned, Ryan Edmonds, P.Eng. (MoTI), Sarah Crookshanks P.Geo. (MoF), Michael Ferguson, RFT, (MoF). Follow-up ground reviews were completed by the above personnel and Pete Wittstock, P.Eng. (SNTG), and Devon Kite, (MoF).

The landslide was primarily mobilized as a debris flow at the location shown in Figure 2. Photos 1 and 2 show the typical channel condition post-debris flow. A small debris slide was observed at approximately the 1550m elevation (Photo 3 and Figure 3) which was responsible for the debris flow initiation. The debris slide initiation was located within and downslope of areas of moderate and high burn severity. The drainage area above the debris slide is about 15 hectares extending up to the height of land at 1850m.

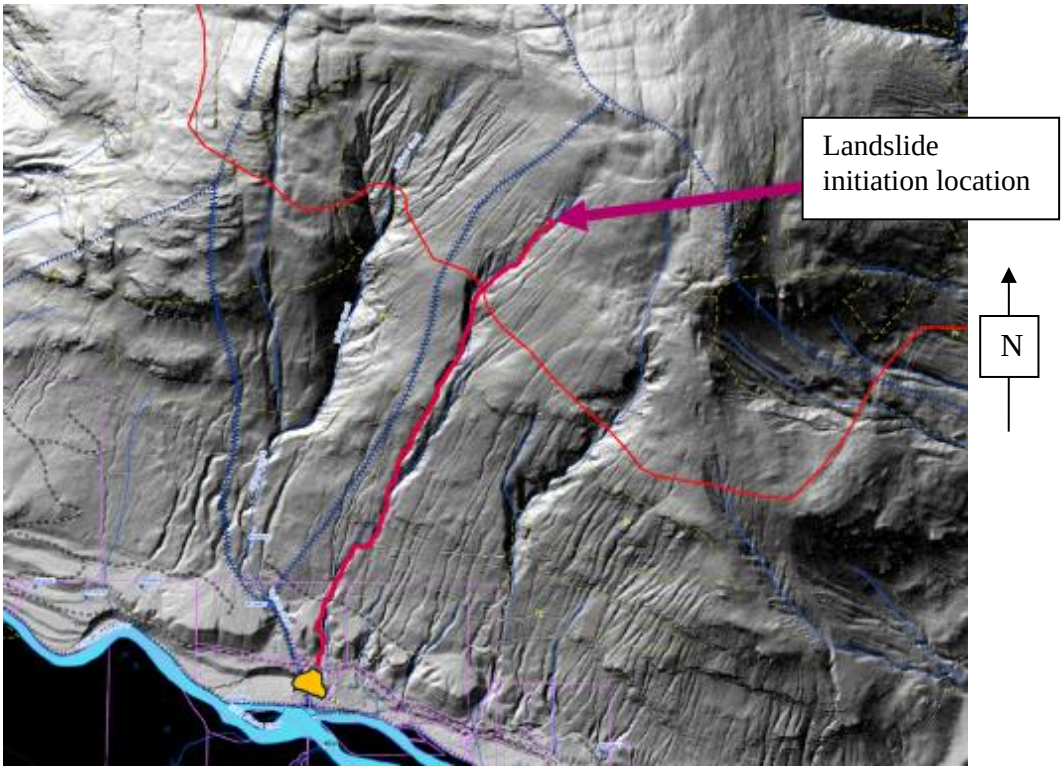

Figure 2 Landslide transport path on LiDAR image

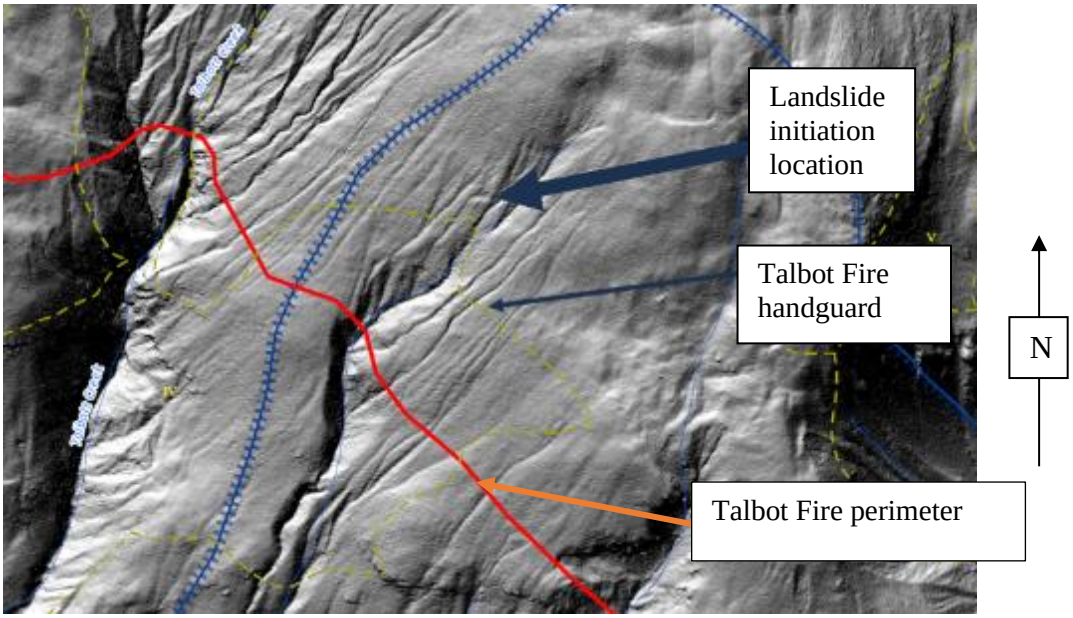

Figure 3 Landslide initiation on LiDAR image

The debris flow traveled through a lower to mid-slope machine fire guard located at the 820m elevation (Photo 4) and remained confined in the channel until it flowed over the fan at 570m

elevation (Photo 5). Figure 4 shows historical debris flow deposits. The total landslide path was approximately 2.3 km.

Significant damage occurred to infrastructure at 3355 Little Slocan South Road (Photo 6) which is located on the alluvial fan directly below the fan apex. Debris was directed to the east down a driveway access road to the Little Slocan South Road. Nuisance debris was carried to portions of the properties located on the lower side of Little Slocan South Road (see Figure 5) due to debris flowing down the driveway (3355) and due to the culvert blockage on Little Slocan South Road. The total landslide deposit volume is estimated at between 2,500 and 5,000m^3. Unit debris flow volume per channel length was calculated at 1 to 2m^3/m which is consistent with the author's experience with other debris flows in primarily bedrock-controlled channels. A profile sketch at the creek location is shown in Figure 6.

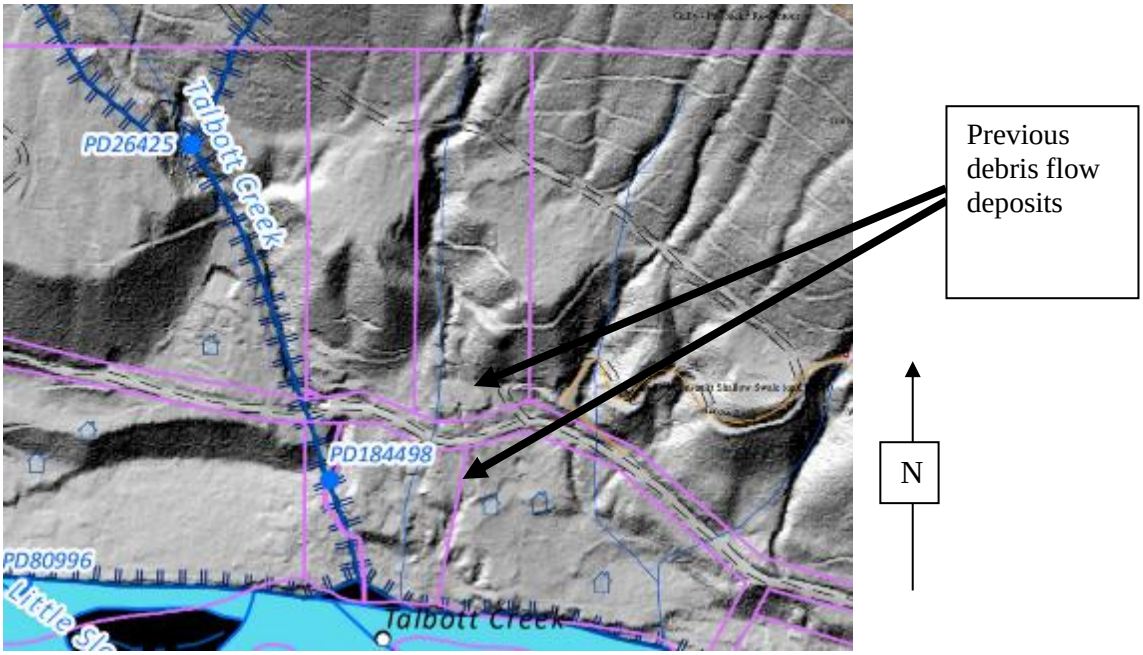

Figure 4 UCET fan and previous debris flow deposits on LiDAR image

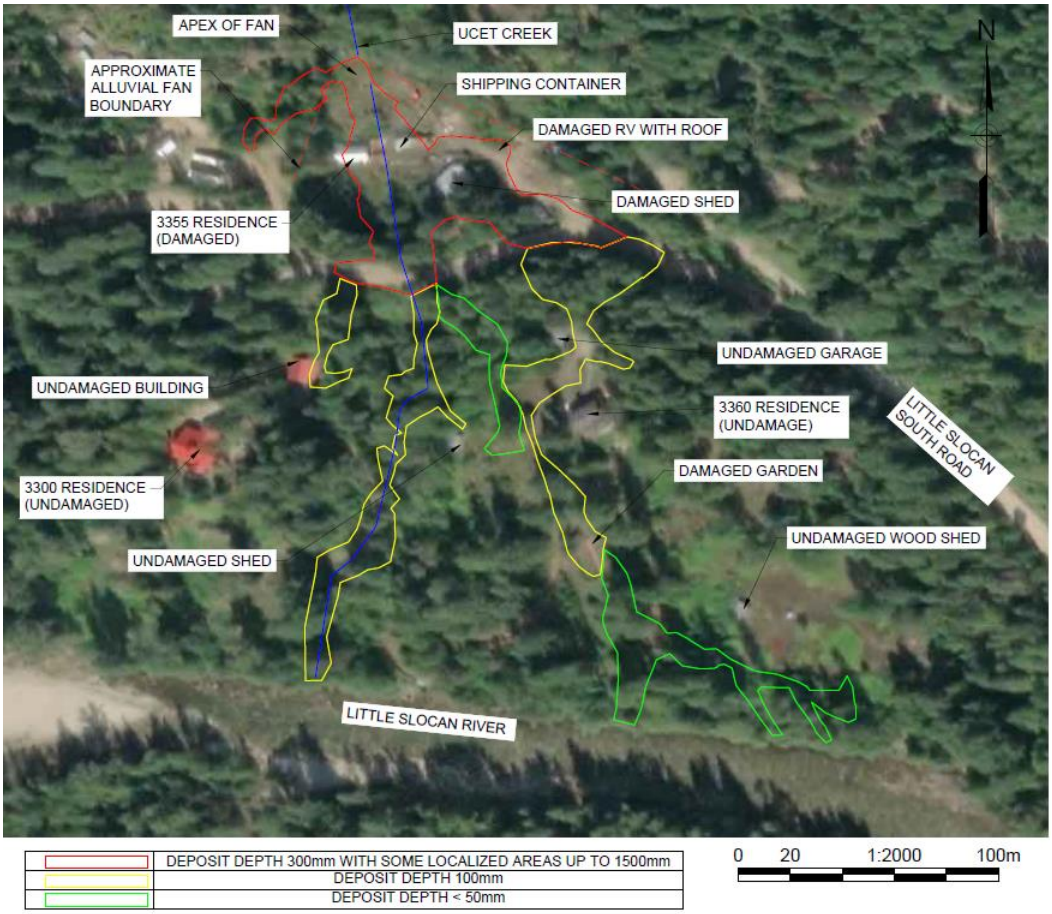

Figure 5. Plan view sketch of the landslide deposit

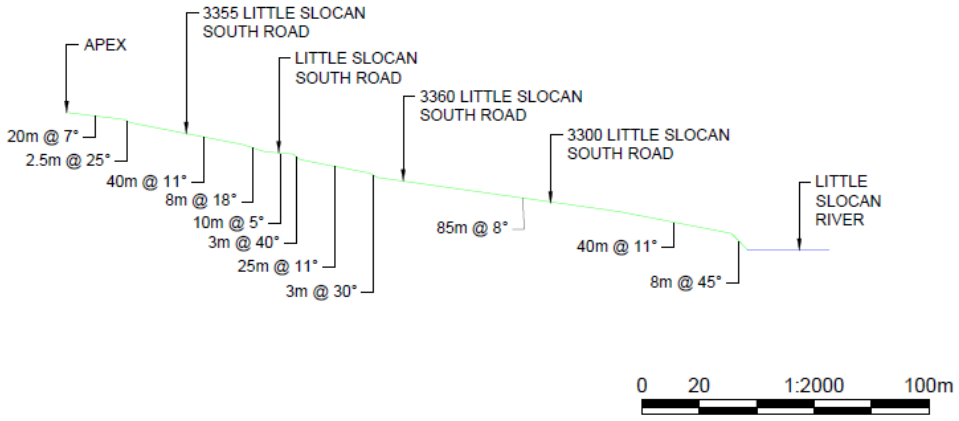

Figure 6. Profile sketch of the fan at the creek location

4. Debris Flow Cause

The debris flow was caused by the initiation of the small debris slide at the 1550m elevation. This debris slide was likely initiated by stream bank undercutting caused by high stream flows due to consecutive very hot and sunny days (30 degrees) resulting in a very rapid snowmelt. The snow cover was patchy at the debris slide initiation location (50% snow cover). The moderate to high burn severity due to the 2020 Talbot Wildfire (upslope of the debris slide initiation location) would have resulted in a higher snowpack and quicker snowmelt under radiant conditions exacerbating the runoff flow volumes.

5. Emergency Response Orders

It was determined that properties located at 3301, 3290, 3465, 3279, and 3364 Little Slocan Road South were not exposed to the hazards of the UCET. Given the scour to bedrock in much of the UCET channel it was considered that a subsequent debris flow initiating as a result of retrogression or enlargement of the debris slide would likely be of lesser volume and would not pose a significant hazard to houses at 3360 and 3300 (although nuisance flooding and damage could still occur). As a result, a recommendation was made to place 3360 and 3300 on evacuation alert.

The property at 3355 Little Slocan South Road is located high on the alluvium fan and exposed to future debris flows (even small volume debris flows). Given the significant snowpack still present between the 1550m and 1850m elevations and the lingering effects of the Talbot Wildfire it is recommended that the property at 3355 remain on evacuation order until this snow has melted. The owner/resident of 3355 was provided a verbal summary of this hazard and recommendation that the property not be occupied at this time. The owners/residents of 3300 were notified of the potential hazard relating to the potential for a culvert failure at the Talbot Creek crossing and were advised to stay clear of the Talbot Creek drainage (adjacent to their property).

6. Residual Hazard

The Talbot Wildfire has elevated the hazard to all the properties located on the UCET fan. However, it is noted that there is evidence of historical debris activity in this drainage and on the fan and this hazard is still present. Future freshet events can result in debris slides of higher volumes entering the gully system and providing additional volume that could be transported in subsequent debris flows which could result in infrastructure damage and loss of life. It is understood that a subsequent debris flow occurred in the Talbot Creek drainage which initiated at a similar elevation as the UCET landslide below an area of 100% moderate and high burn severity. The landslide and surrounding area were subsequently reviewed by Sarah Crookshanks. The present and long-term risk of debris flows should be communicated with local residents.

Closure – Report Use and Limitations

This report was prepared for the exclusive use of the Regional District of Central Kootenay and was conducted as part of an emergency assessment. The material in it reflects SNT Geotechnical Ltd.'s best judgment and professional opinion in light of the information available to it at the time of preparation. Any use that a third party makes of this report or any reliance on or decision to be made based on it is the responsibility of such third parties. SNT Geotechnical Ltd. Accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or action based, or lack thereof, on this report. No other warranty is made, either expressed or implied.

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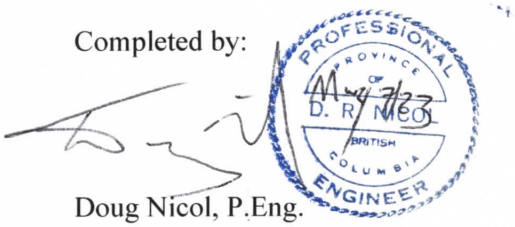

Doug Nicol, P.Eng.
SNT Geotechnical Ltd.

Reviewed by:

Pete Wittstock, P.Eng.
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SNT Geotechnical Ltd.

Appendix A
Photos

Photo 1. Debris flow path lower channel

Photo 2. Debris flow path upper channel

Photo 3. Gully sidewall debris slide at 1550m

Photo 4. Debris flow path through lower fire guard

Photo 5. Debris flow deposit

Photo 6. Debris flow deposit lobe adjacent to occupied dwelling at 3355 Little Slocan South Road

Photo 7. Debris flow deposit. Note lodged debris above and adjacent to the shipping container directing some flow down the driveway to the east and onto Little Slocan South Road.