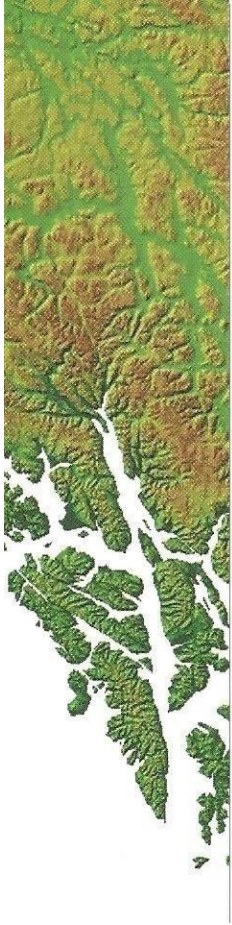


CHILKOOT GEOLOGICAL ENGINEERS LTD.

Box 31146, Whitehorse, Yukon Y1A 5P7
chilkoot.eng@gmail.com (867) 335-5804 c



Geotechnical Evaluation – Geohazard Assessment
Moosehide Slide Area
Dawson City, Yukon – 2017



Dawson Museum Archives - View of St. Mary's Church (1906)

Prepared For: Yukon Government – Energy, Mines and Resources

Date : August 31, 2017



EXECUTIVE SUMMARY
Geotechnical Evaluation – Geohazard Assessment
Moosehide Slide Area
Dawson City, Yukon – 2017

Chilkoot Geological Engineers Ltd. was retained by the *Yukon Government – Energy, Mines and Resources – Lands Management Branch* to conduct a geotechnical evaluation in Dawson City, Yukon. The purpose of the evaluation was to conduct a geohazard assessment of the pre-historic Moosehide Slide (*Ēddhā dādhēchq*) and nearby areas to characterize their conditions and identify potential geohazards which may pose a risk to the North End Subdivision located within the townsite. This work was conducted in order to supplement our September 18th, 2016 geotechnical evaluation of the North End Subdivision where a potential risk to this area from the slide (and potentially nearby slopes) was identified along with a number of other geohazards which are typically encountered in northern permafrost settings.

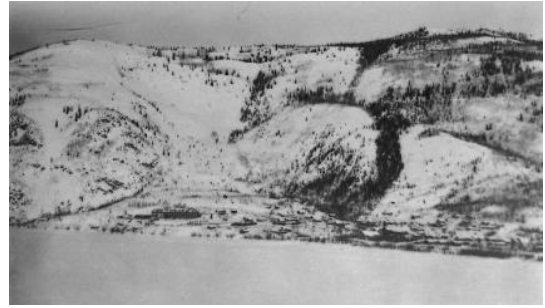


As our evaluation was preliminary in nature, our assessment was conducted from a qualitative perspective to estimate the probability of occurrence and level of severity any identified geohazard may pose. As such, our firm reviewed existing information and characterized the study area through site reconnaissance and auger drilling methodologies.

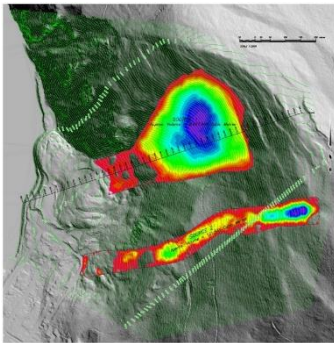
As a potential geohazard risk relating to the presence of an unstable block of soil and rock located near the headscarp of the slide had been previously identified by the *Yukon Geological Survey*, our study predominately focused upon characterizing the slide features in greater detail as the failure mechanisms associated with it are not fully understood.

Our assessment suggests the slide is the result of a single event which has been described as a pseudo-circular rock slope failure (Brideau et al) or else could, in our opinion, be related to a potential wedge failure. The failure is thought to have occurred as a combined result of high porewater pressures and the occurrence of a seismic event (Brideau et al). This event would however have been preceded and followed by other mass wasting slope processes which would have created the terrain features we see today. Our assessment verified that the movement of lower portions of Moosehide Slide are due to rock glacier mechanisms. Movement in the upper realms of the slide appear to be governed by earth flow mechanisms.

Further to our characterization of the slide feature, our firm identified the presence of additional geohazards in the form of a nearby erosion gully and previously poor slope conditions in the region of 3rd Avenue. It was apparent that the discharge area of the gully and slope corresponded to portions of the subdivision in the 3rd Avenue region. The geological information which was retained during our assessment suggested that the gully cycles through periods of instability when most of the discharged material is deposited in a brief time period. Observations of the 3rd Avenue slope noted that it is in a state of natural revegetation which would increase overall slope stability.



As a portion of our work involved working with a survey consultant, *Underhill Geomatics Ltd.* the volume of the slide event and other geological features were also estimated such that the



magnitude of the slide event could be compared with the estimated magnitudes which may correspond to the unstable blocks if they were to fail. The survey data suggests that the magnitude of debris associated with the primary slide event measured in the order of 2,225,000 m³. The total volume of potential debris which may be generated from failure of the unstable blocks was estimated to be no more than 102,000 m³ (or range between 0.6 to 4.6 % of the original slide debris magnitude).

While these geohazards may present a potential risk if the unstable blocks were to fail (en masse), or the slope conditions in the gully or above 3rd Avenue become unstable and; debris from any of these two events is able to propagate into developed regions of the townsite, from a risk stand-point, the probability of any of these events occurring is extremely remote.

As such, based upon our observations, the geomorphic conditions within the study area should allow for continued residential development in the North End Subdivision so long as the upslope conditions are monitored on a yearly basis. The geotechnical setbacks which were recommended in our September 18th, 2016 Geotechnical Evaluation Report should be observed to allow for a factor of safety from some of these potential geohazards. Additional assessment work is recommended to model the run-out path of any potential slope failure originating from the unstable blocks to determine whether or not the resulting debris could impact the townsite. Additional characterization of the region may be required if a higher risk is identified.