



Mustang Powder

3033 Chase Falkland Road, Chase, BC, V0E 1M1

Phone 250-679-8125 Fax 250-679-2999

Toll Free 1-888-884-4666

info@mustangpowder.com

Mustang Lodge Access Road Management Plan (5200 road)

July 28, 2017

Purpose: Roadways

Land File _____

Primary Use of Road: To access commercial property – Mustang Powder Lodge

Introduction

The purpose of this document is to outline a general road maintenance plan for the existing logging road (currently known as the 5200 Road) used by Mustang Powder Lodge to access their ski lodge located just below tree line at 1740 meters in the Anstey range of the Monashee Mountains, approximately 50 km. from Sicamous BC. The road commences at valley bottom where it leaves the North Fork FSR at approximately 20km and ascends for about 11 km to the ski lodge. A location map is provided in Figure 1 below.

This document outlines a general maintenance plan that was implemented by Mustang Powder starting in the summer of 2016 and is intended to continue. The general intent of the road maintenance plan is to provide guidelines to maintain the road in a usable manner adequate for the desired use that will be safe for road users, and will not significantly increase the landslide hazard or have significant detrimental environmental impact.

A terrain stability assessment (TSA) was completed by Onsite Engineering Ltd. in September 2016 with the results presented in the report titled: *“Terrain Stability Assessment; 5200 Road of the North Fork FSR – Access to Mustang Powder Ski Lodge, Perry Creek Area near Malakwa, BC”*. This report forms the basis of the road of the road maintenance plan. A previous TSA was completed in 2001, prior to the construction of the road, by I.B. Geotechnical Ltd. in the report titled: *“North Fork Area, Geotechnical Assessment; FLA18669 – CP713, CBs 2, 3, 4, 5, 6, 8, 10, 14, 15.”* The 2001 report provided guidelines for construction of the road that would result in the least likelihood of landslide. The reader is directed to these reports for an assessment of potential risks associated with the road.

A map of the road alignment is provided as Figure 2. The map corresponds with the figure provided in the 2016 OEL TSA report, and GPS waypoints (wpt) recorded during field work for that assessment are indicated on the map and referenced below.

General Road and Terrain Description

Commencing at Perry River valley bottom at 620 meters elevation the road climbs an east aspect hillside in rugged mountainous terrain. The first 5 km consists of a series of stacked switchbacks that ascend up to the 1200 meter level before the road heads north, crosses a steep creek at wpt 80, and climbs for another 6 km up to the lodge located at 1740 meters. The first 7 km of road was built by Louisiana Pacific in 2001. The last 4 km. was built by Mustang Powder Lodge in 2003.

The road was initially constructed as an industrial logging haul road, and public use was a minor consideration; as such, traffic was generally limited to log haul trucks, lowbeds, fuel trucks and 4x4 pick-ups.

The road crosses variable terrain with slopes gradients of mainly 45-55%, but also crosses steeper slopes to as much as 70-80%. Deep stream gullies containing S5 streams flank the stacked switchback section to the north and south with the road crossing the north stream at upper elevations (as noted above). A smaller middle gully containing a large S6/small S5 stream is located between the two main gullies and is crossed multiple times in the stacked switchback section. Some smaller S6 streams are also crossed at various points.

The majority of the road was constructed with conventional cut and fill techniques with shift into $\frac{3}{4}$ bench and full bench cut through steeper sections. $\frac{3}{4}$ and full bench areas required endhaul of excess material to waste sites along the road. Road grades are in the order of 6-12% with some shorter pitches reaching 15%. The road running width was constructed as between 5-6m with minimal surfacing that consisted of spreading of the local till materials.

An approximately 0.3m deep ditchline runs for the length of the road and 500mm diameter culverts are present in significant drainage paths including seepage points, natural runoff draws and small stream channels. Additional cross drain culverts were also installed to reduce ditch run distances. The multiple crossings of the major stream in the stacked switchback section utilizes 1000mm diameter culverts and the major crossing over the creek to the north utilizes an 1800mm culvert. Both of these creeks have been identified as having potential to host debris flow events which could result in blowout of the culverts.

Numerous areas of regular cutslope failures and erosion of the road surface and fill slopes were identified along the alignment. In addition, areas with significant stability concerns and risk to adjacent resources were outlined in the 2016 OEL TSA report. The areas of significant instability requiring mitigation include:

1. a cutslope failure upslope of wpt 11 and has since been mitigated through construction of a rock buttress;
2. a large landslide that took place upslope of wpt 79 and has also been addressed by a rock and log buttress; and
3. significant cutslope ravelling and instability that has taken place upslope of wpt 81 and has been addressed through ongoing endhaul of failed material. Please refer to the TSA report for an extensive discussion of previous instability.

In addition to the above, a debris flow event initiated in the mid channel upslope of wpt 69 in the spring of 2017. The initiation point was an old road upslope of the 5200 Road and the event ran out to wpt 35, scouring the channel and depositing significant volumes of material on the road surface and in the culverts.

Mitigation measures include endhaul of the deposited material, re-establishment of stream flow through the culverts and some re-armouring of scour stream channels.

Planned Road Use

The following parameters are assumed for road use:

1. Planned use for the road is primarily for access to the Mustang Powder Lodge. This will include 4x4 pickups during snow free months, fuel trucks for a short window (2-3 weeks) during the late summer/fall and infrequent 5 tonne supply trucks. There will be no snow removal during winter other than minor plowing during early spring to get the road open and winter traffic will be restricted to snow cats and snowmobiles.
2. Maintenance equipment on the road will generally include (but will not be limited to) tracked excavators, dump trucks and small dozers.
3. The road will be a permanent access structure that will be in use as long as the Mustang Powder is operating. Should operations at Mustang Powder cease, or the road is no longer required, the road will be deactivated. If deactivation is required, a qualified register professional will be employed to prepare a deactivation prescription and monitor deactivation works.
4. Cross ditches and water bars will be utilized at certain points along the road to shed water from the road surface and reduce road surface erosion; however, these structures may be infilled for short periods of time (2-3 weeks) when fuel trucks are required for fuel delivery.
5. The road will be radio assisted. Kilometer signs are in place.

Road Inspection and Maintenance

Minimum inspection frequencies of the road will occur at the following times:

1. Once during or immediate after spring freshet;
2. Once during late summer to provide time to conduct recommended maintenance before winter;
and,
3. After any major intense or prolonged rainfall events. If an inspection determines a drainage structure is compromised immediate steps need to be taken to mitigate problems.

Inspections will be completed by a qualified individual, typically a Register Forest Technician (RFT), with experience in resource road construction and maintenance. A detailed report outlining what general maintenance is required (culvert clean-out, grading, out slope berm removal as examples) will be produced immediately following the inspection and will be filed and made available for future reference. Equipment will be mobilized to the site promptly to address any issues.

Prior to inspections, the inspector(s) will review both the 2016 OEL TSA report and the approved Lands Tenure Management Plan for this road system to familiarize themselves with the identified risks, analysis, recommendations and suggested maintenance measures to mitigate the risks identified.

If stability concerns are identified during routine inspections that are outside of the experience of the inspector, or stability issues or structural issues with the road prism, or on the downslope terrain are identified during any inspection, a Professional Engineer (P.Eng) or Professional Geoscientist (P.Geo) will be consulted to review the identified issues and prepare mitigation prescriptions.

Regular maintenance will be scheduled and performed as needed, with initial early maintenance targeting early spring immediately following snow free conditions. Typical general issues that will be addressed include:

- Road surface conditions (i.e. presence of surface erosion, potholes, washboard, rutting etc.) and subsequent grading requirements. Additional surfacing will be added where required.
- Any fallen trees or other obstructions will be removed from the road as required.
- Signage condition
- Ditchline function and potential ditch infilling
- Cross-drain culvert function
- Cutslope stability
- Tension cracking of placed fills
- Condition of rock buttresses
- Condition of stream crossing structures (culverts)
- Any other major issues with the road, including failures and ongoing deterioration that can be discerned during an inspection

In addition to the above general issues, the following specific sites have been identified in the 2016 OEL TSA as having significant potential to cause/contribute to a landslide will be monitored in detail:

1. The Road Section between wpt 77 and 79 has been deemed high risk to fail in the future with a significant landslide event occurring. This section of the road is also located in a snow avalanche runout zone. A rock buttress and logs have been installed in addition to ditchline maintenance and culverts. This area is expected to experience ongoing ravel and sloughing of the sand material in the cut upslope of the buttress which will be exacerbated by snow avalanches during the spring months depositing snow and debris on the road. Clearing of debris and re-establishment of drainage patterns is expected to be required each spring and a plan to equipment on site in addition to inspections, as early as possible will be implemented. Communication with a P.Geo or P.Eng terrain specialist will be completed following inspections.
2. The road section between wpt 79 and 80 as been estimated as having a moderate likelihood of a debris flow if significant plugging of the 1800mm culvert takes place. Special care to ensure flow through the culvert remains unimpeded will be completed, including removal of any rocks, logs or other debris that may become lodge in the culvert.
3. The road section between wpt 80 and 82 has been rated as very high for a likelihood of a landslide event occurring. A rock buttress has been constructed to mitigate cutslope failures and ongoing inspection and maintenance of this buttress will be completed to ensure it remains functional. Further, seepage from the site will be monitored to ensure is directed away from the potential failure area.
4. The road crosses a large S6/small S5 multiple times in the stacked switchback section. Crossings were achieved with 1000mm culverts at wpts 17, 23, 35, 46, 62 and 69. Particular care will be given to monitor to function of each of these culverts including removal of any rocks, logs or other debris that may become lodge in the culvert. Note that a debris flow took place in this creek during the spring of 2017 (as noted above), after the OEL report was written.
5. A rock buttress has been installed upslope of wpt 11 to address an oversteepened, revelling cutslope. Ongoing inspection and maintenance of this buttress will be completed to ensure it remains functional.

- 6. Where installation of new stream culverts, replacement of existing culverts / structures or any other work or maintenance in and about a stream is required, a P.Eng or P.Geo will be consulted to conduct a hydrological assessment of the site. In addition future proposals for stream crossing maintenance and/or replacement of structures have a prior requirement of a section 11 Water Sustainability Act application (previously a section 9 under the Water Act which has been repealed in Feb 2016).

Snow Avalanche Concerns

During winter months, Mustang Powder employs certified ski guides with minimum Canadian Avalanche Association (CAA) level 2 training. A daily winter avalanche forecast for the 5200 road will be completed by these guides at their morning guides’ meeting and relayed to any Mustang Powder staff on contractors that may be using the road. This avalanche forecast will occur from Dec. 1 to April 1 each year.

Further, Mustang will post a sign at the valley bottom (km. 21) end of the 5200 road warning the public that sections of the 5200 road are subject to avalanche danger and users should radio or phone the lodge before proceeding.

Closure

The above plan provides an outline of our intent to complete maintenance to the 5200 Road providing access to the Mustang Powder Lodge. If there are questions or comments concerning the plan, please contact the undersigned at you convenience.

Nick Holmes-Smith
Proprietor of Mustang Powder

Signed: _____ Date:_____

HER MAJESTY THE QUEEN IN THE RIGHT OF THE PROVINCE OF BRITISH COLUMBIA,
by its authorized representative

Signed: _____ Date:_____

- Encl:
- Figure 1: Location Overview Map for 5200 Road
- Figure 2: Terrain Stability Assessment Map for 5200 Road

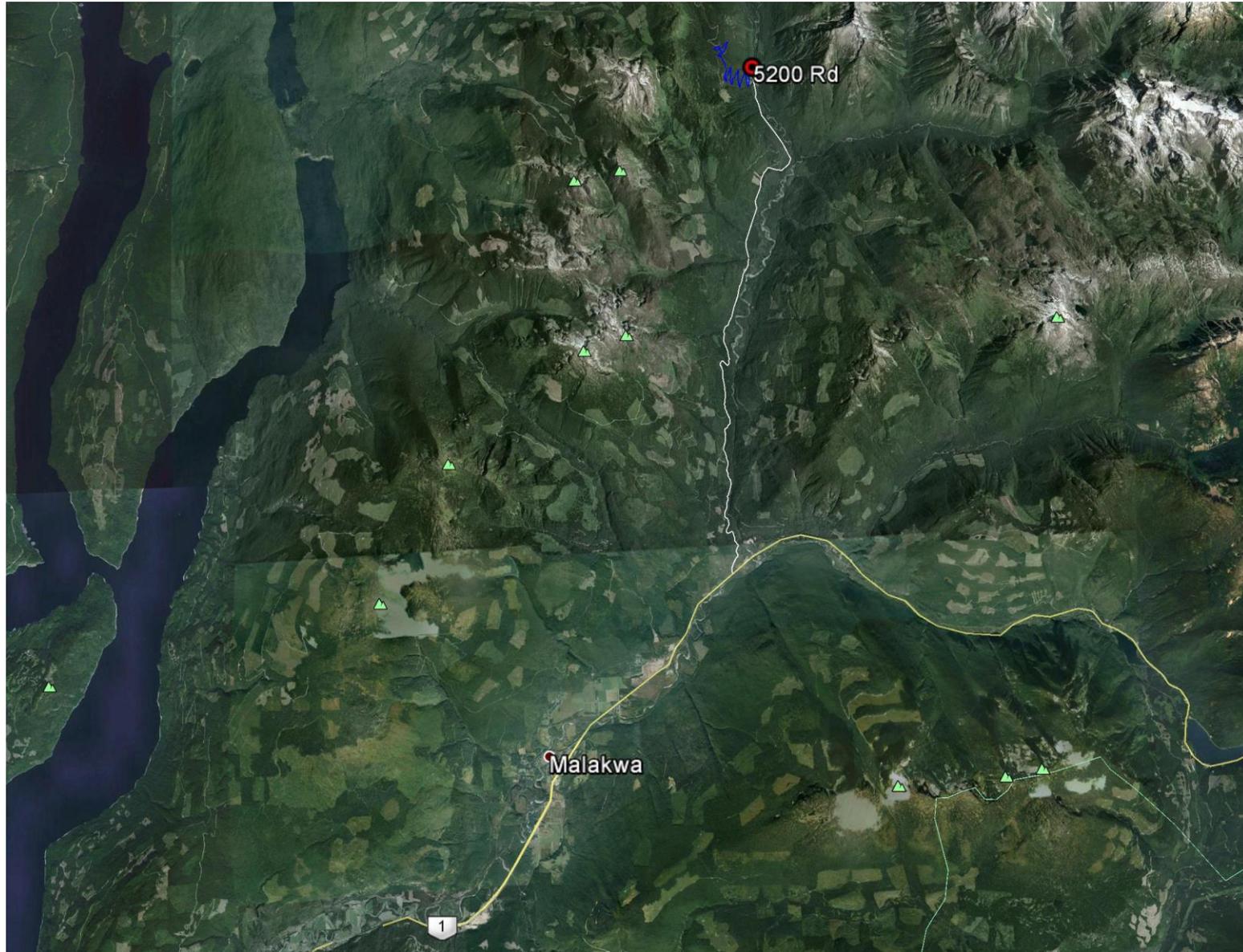
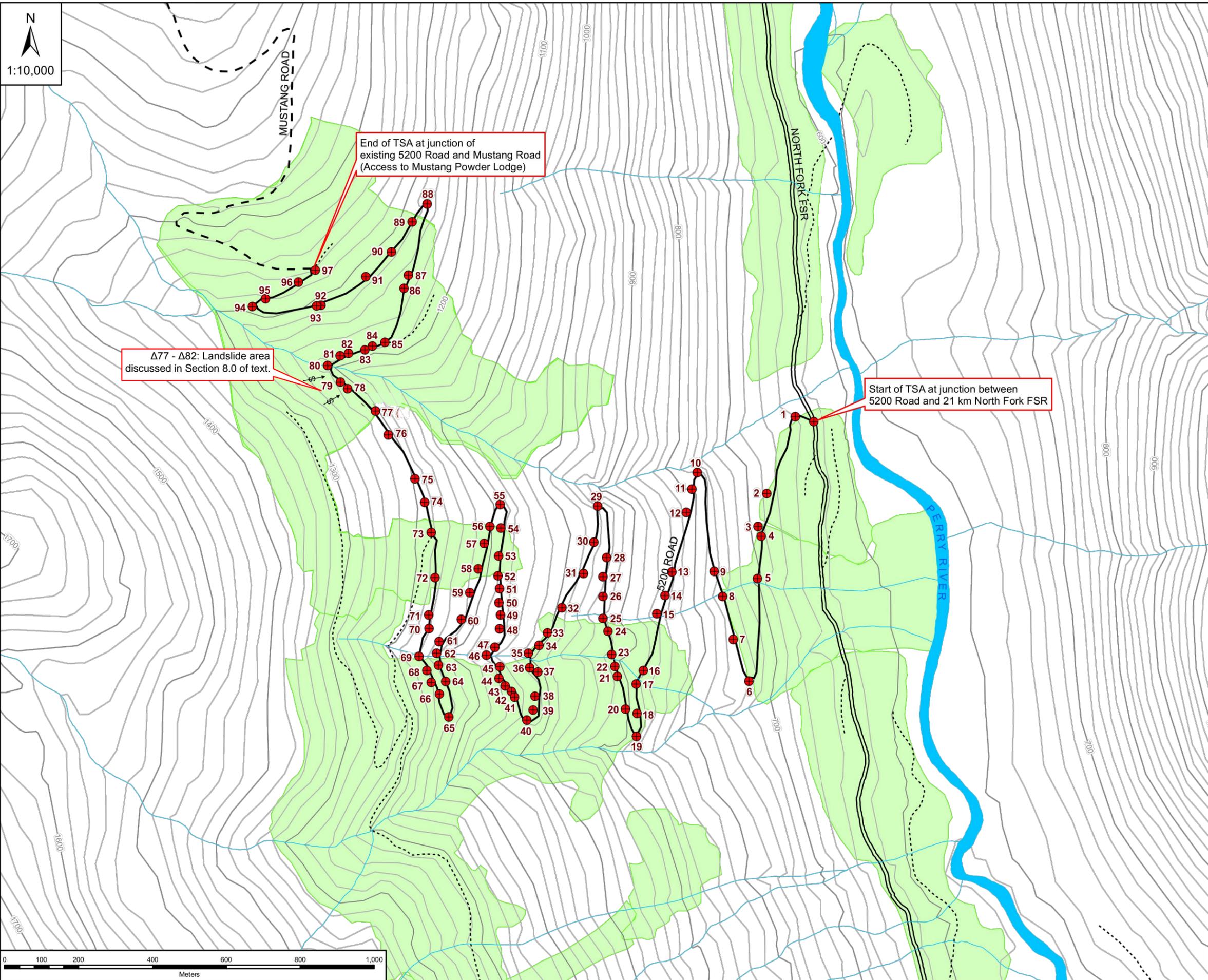


Figure 1 Location Key Map



LEGEND

- NORTH FORK
- 5200 ROAD
- MUSTANG ROAD
- SPUR ROADS NOT ADDRESSED IN THIS REPORT
- ROAD STATIONS REFERENCED IN TABLE 7.1 OF REPORT
- LOGGED CUTBLOCK

ONSITE
Engineering Ltd.
INTERIOR OPERATIONS
330 42nd STREET SW
SALMON ARM, BC
PH.: 250-832-3366
FAX: 866-235-6943

TERRAIN STABILITY ASSESMENT
MAP FOR 5200 ROAD

MUSTANG POWDER

PROJECT No.

SHEET 1 OF 1

DWG. No. **FIGURE 2** REV. No. **A**

ISSUED FOR REPORT - 06-AUG-2016