

**MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT
POST-WILDFIRE NATURAL HAZARD RISK ASSESSMENT**

RECONNAISSANCE REPORT

NOTE: The results given on this form are preliminary in nature and are intended to be a warning of potential hazards and risks. It is not a final risk analysis and further work may alter the conclusions.

FIRE: K61884 White Rock Lake	FIRE YEAR: 2021	DATE OF REVIEW: September 9 and 24, 2021 DATE OF REPORT: October 14, 2021
AUTHOR: Tim Giles, MSc, PGeo, Geoscientist, Westrek Geotechnical Services Ltd.		
REPORT PREPARED FOR: BC Ministry of Forests, Lands and Natural Resource Operations and Rural Development ("The Ministry") – <i>Thompson Okanagan Region, Cascades, and Okanagan Shuswap Natural Resource Districts</i> BC Wildfire Service – <i>Kamloops Fire Centre, Merritt, Vernon, and Penticton Fire Zones</i>		
FIRE SIZE, LOCATION, AND LAND STATUS: The fire was approximately 83,342 hectares in size. The Ministry-produced Natural Hazard Assessment map is attached for reference. The land status is a mix of private, municipal, First Nations reserves, Provincial Parks and Crown land.		
VALUES AT RISK: Much of the White Rock fire was on the Thompson Plateau, encompassing a large part of the Salmon River watershed as well as reaching watersheds tributary to Okanagan Lake. It advanced north into the community of Monte Lake and burned several residences. Around the Monte Lake area there are impacted slopes above residences and outbuildings, highways, other roads, and the CN Rail line. On the western shore of Okanagan Lake, large areas of burned slopes exist above the residential communities of Ewing and Killiney Beach. Several small creeks pass through these communities as they enter Okanagan Lake and there is potential for elevated streamflow impacting the residential areas as well as Westside Road. The watersheds of Whiteman-Bouleau, Naswhito and Equesis Creeks are all significantly burned and there is potential for elevated streamflow as a result of the wildfire. Large communities on the fluvial fans of these watersheds are potentially at risk from flooding.		
WATERSHEDS AFFECTED: <u>South Thompson River</u> - The White Rock Fire burned across much of the upper Salmon River watershed above Westwold which enters Shuswap Lake and the South Thompson River drainage. Small parts of the Monte and Paxton creek watersheds were also burned. <u>Nicola River</u> – A small part of the upper Chapperton drainage was burned. <u>Okanagan Basin</u> - on the east side of the fire, the watersheds of Irish, Newport, Bradley, Equesis, Naswhito and Whiteman-Bouleau Creeks were all extensively burned. <ul style="list-style-type: none">• Whiteman-Bouleau: 56% moderate and high burn severity• Naswhito: 45% moderate and high burn severity• Equesis: 21% moderate and high burn severity	BURN SEVERITY (map attached) A burn severity map was compiled by Westrek Geotechnical Services Ltd. The vegetation burn severity map uses satellite images to estimate the change to vegetation canopy. For the White Rock Fire, the images compared were taken September 9, 2020, and September 24, 2021.	

HAZARDS AND POTENTIAL RISKS ASSOCIATED WITH FIRE:	POST-FIRE HAZARD ¹	POST-FIRE RISK ²
<ul style="list-style-type: none"> A small portion of the Paxton Creek watershed burned north of Highway 97. Paxton Creek flows west through a culvert under Highway 97 into the Monte Creek system which flows north into the Thompson River. A mix of unburned, low, moderate, and high burn severities were observed within the watershed and the effects of the fire are expected to be incremental increases in sediment movement and channel degradation. The flow in the creek is expected to increase during spring freshet and after rainfall events. Landslides are not expected and any that do occur should be of limited size and only impact short reaches within the creek channel. Properties and structures along Paxton Creek may be impacted by increased flooding as a result of the fire. 	Low for flooding along Paxton Creek Low for landslides within the Paxton Creek watershed	Low for flooding along Paxton Creek Low for landslides within the Paxton Creek watershed
<ul style="list-style-type: none"> A small area of the Monte Creek watershed (not Monte Lake) burned south of Highway 97. A mix of unburned, low, moderate, and high burn severities were observed, and effects of the fire are expected to be incremental increases in sediment movement and channel degradation. Landslides are expected on the steeper slopes, but they should be of limited size and only impact short reaches within the creek channels. Properties and structures downstream of the fire on Monte Creek are unlikely to be affected by the effects of the fire. 	Low for flooding along Monte Creek	Low for flooding along Monte Creek
<ul style="list-style-type: none"> The Salmon River watershed was extensively burned upstream from the Highway 97 corridor at Westwold. Numerous smaller watersheds, including, Rush, Goodwin, Cain, Weyman, Random, Ingram and Twig Creeks were heavily impacted. It is anticipated that the effects of the fire might be noticed during the next 2 or 3 spring freshets as snowmelt occurs earlier and freshet flows may be flashier. Increased sedimentation is expected along these creeks which may cause increased degradation of the channels. Landslides are expected but will be limited to steep-sided valley-sidewall events which will impact relatively short reaches within the creek channels. Properties and structures along the lower Salmon River (as far downstream as Westwold) may be impacted by flooding as a result of the fire. 	Low for flooding on Salmon River Low for landslides within the Salmon River watershed	Low for flooding on Salmon River Low for landslides within the Salmon River watershed
<ul style="list-style-type: none"> Monte Lake drains into the Salmon River watershed west of Westwold. On the south side of the lake are numerous creek draws which were extensively burned at moderate to high burn severities. One small erosional sedimentation event was observed on the south side of Monte Lake during the overview flight. There was no clear initiation landslide and it appeared that the event was primarily sediment-laden streamflow. The majority of sediment was deposited above the CN Rail line, but water did reach the tracks. Drainages on the south side of the lake are expected to see further small erosional sedimentation events. Above Highway 97 on the north side of the lake are numerous small creek draws which were extensively burned at moderate to high burn severities. These creek draws are expected to respond rapidly to rainfall events, and nuisance sedimentation events are expected to impact the highway. Properties and structures on both sides of Monte Lake may be impacted by nuisance sedimentation and overland flows as a result of the fire. 	Moderate for flooding around Monte Lake High for landslides around Monte Lake	Moderate for flooding around Monte Lake High for landslides around Monte Lake

<ul style="list-style-type: none"> A small portion of the northeastern headwaters of the Chapperon Creek watershed was burned and there was a mix of unburned, low, moderate burn severities. The watershed was extensively harvested prior to the fire. Effects of the fire are expected to be incremental increases in sediment movement and channel degradation. Landslides are not expected and any that do occur should be of limited size and only impact short reaches within the creek channels. The small watersheds of Newport and Bradley Creeks and the face units beside them were extensively burned. They are expected to have increased streamflow and associated sedimentation. Sediment aggradation may occur in the creek channels on the alluvial fan surfaces. This may cause overbank flooding and potential migration of the channel appears possible across much of the very gently sloped, lower fan surfaces. Numerous residences are present along the shoreline of Okanagan Lake below Newport Creek, some of which could be inundated if the main creek migrated laterally across the lower fan surface. Several west-flowing tributary drainages in the Irish Creek watershed were burned. These creek draws are expected to respond to rainfall events with increased streamflow and associated sedimentation. These nuisance sedimentation events may impact properties and structures on the upper floodplain of Irish Creek which has been developed primarily for agricultural use Around 32% of the Eques Creek watershed was burned, but of the areas that burned 65% were moderate or high burn severity. The Eques Creek fan did not burn during the wildfire. McGregor and Musgrave creeks were both extensively and severely burned and are expected to have increased streamflow and sedimentation. The upstream floodplain of Eques Creek has been developed for agricultural use with numerous residences present. The increased streamflow and sediment movement along upper Eques Creek has the potential to cause overbank flooding along the upper creek. Downstream from the wide floodplain reach the creek has a narrower incised channel down to the large coalescent fluvial fan which it shares with Naswhito Creek. From the fan apex down to Westside Road, there are several residential structures adjacent to the creek. The creek is constricted at Westside Road where passes it through an arch culvert onto the lower fan surface. Downstream of the highway, at least two water diversions for agricultural irrigation purposes are visible. Increases in sediment transport from the upper watershed and delivery to the fan is expected. Sediment aggradation in the creek on the fan surface may cause overbank flooding and potential migration of the main channel appears possible across much of the very gently sloped, lower fan surface. Numerous residences are present along the shoreline of Okanagan Lake, some of which could be inundated if the main creek migrated laterally across the lower fan surface. The Naswhito Creek watershed had a mix of unburned, low, moderate, and high burn severity patches (45% moderate and high); the fluvial fan was partially burned during the fire. The creek follows a confined valley down to the apex of the large coalescent fluvial fan 	<p>Low for flooding on Chapperon Creek</p> <p>High for flooding on the Newport and Bradley Creek fans</p> <p>Moderate for flooding on upper Irish Creek</p> <p>Moderate for flooding on the Eques Creek fan</p> <p>Moderate for landslides in the tributary watersheds.</p> <p>Moderate for flooding on the Naswhito Creek fan</p>	<p>Low for flooding on Chapperon Creek</p> <p>High for flooding on the Newport and Bradley Creek fans</p> <p>Moderate for flooding on upper Irish Creek</p> <p>Moderate for flooding on the Eques Creek fan</p> <p>Moderate for landslides in the tributary watersheds.</p> <p>Moderate for flooding on the Naswhito Creek fan</p>
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<p>it shares with Eques Creek. Upstream of the fan apex there is no development along the tight valley floodplain. There are a few residences upstream of Westside Road on the upper fan surface. At Westside Road, the creek passes through an arched culvert and then crosses undeveloped agricultural land before entering Okanagan Lake through a narrow outlet with residences on both sides of the channel. It is expected that there will be a minor increase in streamflow and sediments delivered to the apex of the fan. Minor sediment aggradation in the creek on the fan surface has the potential to cause some overbank flooding.</p> <ul style="list-style-type: none"> The Whiteman-Bouleau Creek watersheds had high burn severities along the deeply incised, steep-sided valleys leading to the plateau surface (56% moderate and high). The creeks join once they leave the hills and the lower 6 km passes through a confined valley with several private land parcels, some with what appear to be residential structures. The Whiteman-Bouleau fan is a large, low gradient fluvial fan which has been extensively developed for residential and recreational use; the fan was not burned during the wildfire. The creek passes under a bridge on Westside Road in a confined channel. A residential area exists on the north bank of the creek downstream of the highway and numerous residences are present along the shoreline of Okanagan Lake. It is expected that there will be a significant increase in streamflow and sediments delivered to the apex of the fan above the highway. Sediment aggradation in the creek on the fan surface may cause rapid overbank flooding and potentially lateral migration of the creek could occur across much of the gently sloped lower fan surface. The Killiney Beach area (Westside Road between Morden Creek to Sugar Loaf FSR) was extensively burned, and numerous residences were destroyed. Topographic maps indicate that there are several small watersheds which drain through the residential areas. There is an expected increase in surface flows through the creeks leading through the residences and into Okanagan Lake. Properties and structures in the Killiney Beach area may be impacted by nuisance sedimentation and overland flows as a result of the fire. <p><i>1. Hazard = $P(H)$, the probability of occurrence of a hazardous event. It does not address the natural or pre-fire hazard that may already have existed.</i></p> <p><i>2. Risk = Partial risk $P(HA) = P(H) \times$ the probability of it reaching or affecting an element at risk</i></p>	<p>High for flooding on lower Whiteman Creek and on the Whiteman Creek fan</p> <p>High for landslides in the tributary watersheds</p> <p>High for flooding + landslides in the Killiney Beach area</p>	<p>High for flooding on lower Whiteman Creek and on the Whiteman Creek fan</p> <p>High for landslides in the tributary watersheds</p> <p>High for flooding + landslides in the Killiney Beach area</p>
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FURTHER ACTIONS:

Post-wildfire assessments are recommended for several areas of the White Rock wildfire to assess the potential impacts that the wildfire has had on the natural hazards and to present potential options that the stakeholder can consider for mitigating their risk. Specific sites are:

- Paxton Creek – MOTI are recommended to review their drainage structures along Paxton and North Paxton Creeks upstream from Highway 97.
- Monte Lake – MOTI are recommended to review ditch lines and culverts on Highway 97 between the Paxton Valley Road and the CN Rail track crossing east of Monte Lake. Residents around Monte Lake should also be warned of the increased potential for nuisance sedimentation and overland flows as a result of the fire.
- A watershed review of the Newport, Bradley and Irish Creek watersheds. This review should include an understanding of the potential impacts to the Newport and Bradley Creek fluvial fans of the increase in streamflow and sedimentation from the upper watersheds. A review of the west-facing tributary creeks in

the Irish Creek watershed should determine the potential impact of increased streamflow and sedimentation to the properties in upper Irish Creek watershed.

- A watershed review of the Whiteman (and Bouleau) Creek watersheds and the fluvial fan. This review should include an understanding of the potential impacts to the creeks of the increase in streamflow and sedimentation from the upper watershed down to Okanagan Lake.
- A watershed review of the Equesis and Naswhito Creek watersheds and their coalescent fluvial fan. This review should include an understanding of the potential impacts to the creeks of the increase in streamflow and sedimentation from the upper watershed down to Okanagan Lake.
- A review of the drainages in the Killiney Beach area. This review should include the area upslope to the height of land from Morden Creek in the south to the start of the Sugar Loaf Forest Service Road in the north.
- CN Rail should independently assess all of their infrastructure within the fire perimeter.

SIGNATURE:	ATTACHMENTS:
 2021-10-14 Tim Giles, MSc, PGeo, October 14, 2021 Senior Geoscientist <i>Westrek Geotechnical Services Ltd.</i> Permit to Practice Number: 1002522	This is an electronic replica of the original signed and sealed report and has been provided for convenience. Westrek has retained the original signed / sealed report on file and can provide an authenticated document if required. K61884 White Rock Lake Natural Hazard Assessment Map K61884 White Rock Lake Vegetation Burn Severity Map

Thompson Okanagan Region, reconnaissance report form, version 2.0, 1 August 2017

White Rock Lake

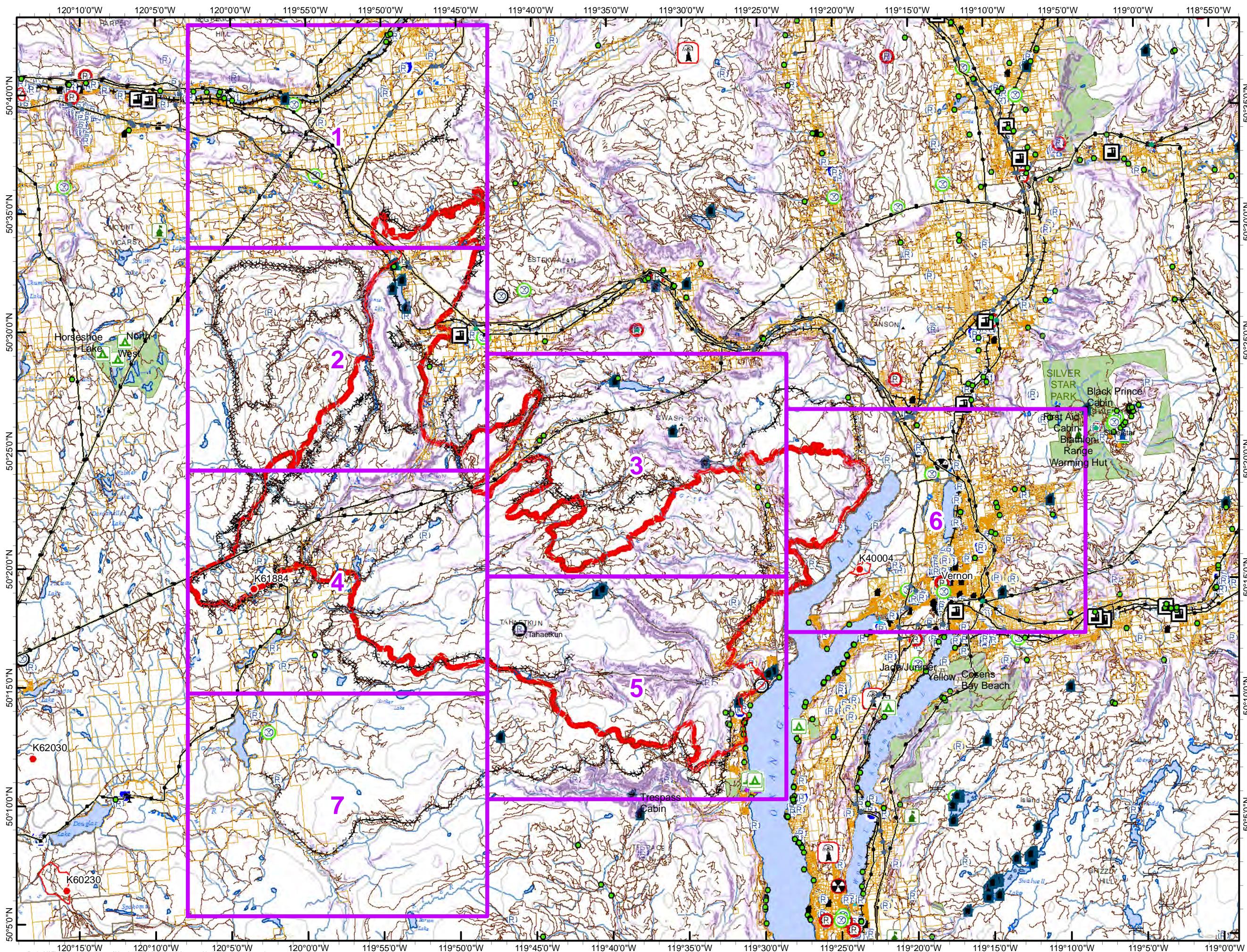
K61884

Natural Hazard Assessment

Map Date: August 27, 2021

Perimeter Date: 2021-08-26

Hectares: 81453.20938695



This map may contain
CONFIDENTIAL

Disclaimer:

Wildfire perimeters for the current fire season, including both active and inactive fires, are supplied from various sources. The data is refreshed from operational systems nightly to the public map. Wildfire data may not reflect the current fire situation, and therefore should only be used for reference purposes.

Wildfire data from the incident is updated when practicable and the occurrence of individual fire updates will vary. The information is intended for general purposes only and should not be relied on as accurate because fires are dynamic and circumstances may change quickly. The levels of current fire activity within the mapped fire perimeters can vary widely.

Data Sources and Notes:

Projection: NAD 1983 BC Environment Albers
Created by: jdekerse



Ministry of
Forests, Lands, Natural
Resource Operations
and Rural Development
BC Wildfire Service

