

BRITISH COLUMBIA MINISTRY OF FORESTS: POST-WILDFIRE NATURAL HAZARD RISK ANALYSIS

LEVEL 2 RECONNAISSANCE REPORT – QUILPITUK CREEK (K51402) FIRE

NOTE: The results given on this form are reconnaissance in nature and are intended to be a warning of potential hazards and risks. It is not a detailed risk analysis, and further work may alter the conclusions. Please read the appendix of this report for important limitations. Contact the author for more information.

FIRE NUMBER/STATUS: K51402 Quilpituk Creek Wildfire - classified as held on Aug. 19, 2026.		FIRE YEAR: 2026	DATE OF FIELD REVIEW: August 28, 2026 DATE OF REPORT: September 22, 2026
AUTHOR: J. Clarke, M.Sc., P.Geo., Geomorphologist, Clarke Geoscience Ltd.			
REPORT PREPARED FOR: Kamloops Fire Center (KFC)			
Fire Size: 1278 ha	Location: The fire is located on east-facing slopes south of the La Casa subdivision and north of Shelter Cove along Okanagan Lake.	Land Jurisdictions: - Regional District of Central Okanagan - Provincial public lands	
POTENTIAL KEY ELEMENTS AT RISK: - Residences and Structures along Westside Road, including human safety - Westside Road and road users <i>Domestic water supply sources in the study area are licensed springs (no surface water sources)</i> <i>Potential elements at risk are indicated on the attached Post-Wildfire Natural Hazard Risk Analysis Map 001.</i>			
WATERSHEDS AFFECTED:	TOTAL AREA (km²)	WATERSHED AREA (%) BURNED	AGGREGATE BURNED (%) AT MODERATE AND HIGH SEVERITY
Tributary North of Quilpituk	3.84	31	23
Quilpituk Creek	4.47	97	80
Tributary Q1	0.77	98	86
Tributary @ Nahun	0.51	96	71
Tributary @ Caesar's Landing	1.08	87	59
Tributary Q4	0.98	37	22
Face units are not included in the summary table because there is no single point of flow discharge. OVERVIEW: The Quilpituk Creek Fire burned 1,278 ha (~13 km²) on the east facing slopes along Okanagan Lake, south of the La Casa subdivision and north of the Shelter Cove subdivision, approximately 25 km north of West Kelowna, BC. Affected private properties are within the jurisdiction of the Regional District of the Central Okanagan (RDCO). The fire extended approx.~5 km along Westside Road and measured between 2 and 4 km wide. The fire did not cross Westside Road. The Quilpituk Creek Fire was discovered on August 1 and was classified as being held on August 19, 2026. Aerial reconnaissance of the burned areas was conducted on August 28, 2026, and a ground-based field assessment was conducted on September 9, 2026, by Jennifer Clarke, M.Sc., P.Geo. and accompanied by Bruce Weaver of the OKIB Territorial Resource Department. The field review included accessing the study area by vehicle along the resource roads and accessible fireguards, with limited ground traverse, as well as accessing most stream			

crossings along Westside Road. The natural hazard and risk analysis methodology is presented in Appendix A and select photos from the reconnaissance are presented in Appendix B.

Westside Road roughly forms the eastern boundary of the fire. Residences on private land are located on the downslope side of Westside Road along Okanagan Lake.

The height of land and areas affected by the Quilpituk Creek Fire lie below 1300 m elevation, which means that the winter snowpack is subject to melt in the late fall and early spring, when rain and warm temperatures can cause rapid snow melt and runoff. These areas are also prone to intense convective rainstorms through the summer months. Both processes drive the runoff processes that generate sediment-laden flows and debris floods, and landslides that can generate debris flows. Post-wildfire natural hazards are more likely to occur in the late-fall, early-spring, and during intense rainstorms.

SUMMARY OF TERRAIN CONDITIONS, THE EFFECTS OF THE FIRE, AND PREVIOUS FIRE ACTIVITY IN THE SURROUNDING AREA:

Terrain within the fire perimeter is characterized by six (6) small (50 ha to 450 ha), steep catchment areas, separated by face unit slopes. The upper elevation areas impacted by the wildfire drain north into Shorts Creek and south into Bald Range (Lambly) Creek. These two areas are insignificant relative to the watershed size and post-wildfire impacts are considered highly unlikely. No further assessment of the Shorts Creek and Lambly Creek areas is completed.

The north side of the study area is accessed from Westside Road south of La Casa along a permitted resource road (Terrace Mtn Road). The road connects with Bald Range Creek Road under permit to Tolko Industries Ltd., which originates at Bear Main FSR to the south and extends north through the study area towards Terrace Mountain. There is constructed fireguard along the north and south perimeters of the fire. Roads and fireguards that were accessed for the field review were found to be in generally good condition. Older spur trails extending from the permitted roads were found to be in good condition or were rehabilitated and are no longer accessible. Although not mapped, imagery shows an older (non-status) resource road that traverses the lower slopes (~560 m elev.) of the study area above Westside Road. The condition of this road is unknown. Unlike some areas to the south, the trail network throughout the study area is not extensive and is mostly constrained by steep bedrock slopes.

Quilpituk Creek is the largest affected catchment (450 ha), characterized by moderately-steep, to steep, slopes separated by narrow benches, before becoming entrenched within a steep gully (see Photo 1). The tributary north of Quilpituk Creek has a similarly sized catchment area (384 ha) and is characterized by short rocky slopes separated by low gradient benches comprised of glaciofluvial sediments. Other catchments within the study area are smaller and contain ephemeral streams on slopes characterized by irregular and hummocky bedrock (see Photos 2 and 3). The streams are discontinuously contained within steep gullies. The lower reaches of the Tributary at Caesar's Landing and Tributary Q4 (at the south end of the study area) encounter low to moderate gradient benches comprised of glaciofluvial sands and gravels, as well as glaciolacustrine silt (see Photo 3). Along these reaches, located immediately upslope of Westside Road, evidence of surface flow is largely absent as the flows infiltrate and become subsurface (groundwater).

Face unit slopes between the small catchments are moderately-steep, characterized by hummocky coarse-grained bedrock, and surface soils are shallow. Burn severity is variable, with less severe burn along the lower slopes. There is a general lack of gullies and a low potential for generating hazardous erosional processes along these slopes.

An empirical relation of slope height (relief) and drainage area, called the Melton Ratio, provides a surrogate for catchment "roughness", which indicates the dominant hydrogeomorphic process. A summary of these values and the corresponding process types is provided in Table 1 below. Quilpituk Creek and the Tributary North of Quilpituk Creek are prone to both debris flood and debris flow, which is described as a continuum between high-energy sediment-laden flooding and a fluidized landslide, both of which are powerful processes capable of

damage. For the other, smaller catchments, based on watershed characteristics, debris flow is the dominant process. However, evidence of past (i.e. within a few hundred years) debris flow events was not detected during the field review. The likelihood of a debris flow initiating, and reaching, Westside Road and properties located downslope, is dependent on many factors including sediment supply, connectivity between the side slopes and the channel, channel gradient, and the occurrence of an appropriately sized triggering event. Although the occurrence of such events is infrequent in the study area, the effects of wildfire significantly reduce the amount of rainfall or snowmelt required to trigger an event.

Table 1: Dominant Hydrogeomorphic Process for Study Area Catchments

Watershed	Area (km²)	Relief (m)	Watershed Length (km)	Melton Ratio	Dominant Hydrogeomorphic Process based on Melton Ratio Classification
Tributary North of Quilpituk	3.84	970	3.93	0.50	Debris flood and debris flow
Quilpituk Creek	4.47	940	3.55	0.44	Debris flood and debris flow
Tributary Q1	0.77	620	2.23	0.71	Debris flow
Tributary at Nahun	0.51	540	1.74	0.76	Debris flow
Tributary at Caesar's Landing	1.08	620	2.13	0.60	Debris flow
Tributary Q4	0.98	560	1.85	0.57	Debris flow

Portions of the study area were previously burned and then subsequently reburned by the 2026 fire (see Map 001). These include:

- upslope areas within the Quilpituk Creek and the Tributary North of Quilpituk Creek catchment were burned in the 2009 Terrace Mountain Fire (K50720) and reburned in 2026;
- a large part of Tributary Q4 was burned in 2015 Shelter Cove Fire (K50391) and reburned in 2026;

The north boundary of the 2023 McDougall Creek Fire (K52767) lies only 2 km south. On April 2, 2025, a large debris flow occurred on Reid Creek, located only less than 4 km to the south. Reid Creek is a small ephemeral catchment that is similar in character to the study area catchments. The event resulted in a fatality downslope of Westside Road. The landslide-triggered event occurred two years after the catchment was burned and was associated with rapid snow melt and rainfall and was complicated by the presence of old resource trails in the upper catchment.

Mapped Vegetation Burn Severity (VBS) in the burned area is shown on Map 001 and summarized in Table 2 below. VBS was classified by MOF using comparative same-year satellite imagery based of the degree of damage to the forest canopy, understory and ground cover. In general, the mapped VBS throughout the study area is predominantly "moderate", which is described as having burned/dead trees, scorched needles that remain on trees, and a burned and blackened understory.

On the ground field checking was completed to correlate and validate VBS with a corresponding impact on soils known as Soil Burn Severity (SBS). This is an important determination for the likelihood of hydrologic effects such as water-repellent soils and the resultant impact of runoff. In general, areas mapped as moderate VBS were observed to have discontinuous pockets of high burn severity and indicators such as the consumption of surface

litter, duff, exposure of mineral soils, and a strong (but discontinuous) water repellency (see Photo 4). It is judged that VBS mapping slightly under-estimates the impact of the wildfire on soils within areas mapped moderate burn severity.

Table 2: Vegetation Burn Severity throughout the Study Area

Catchment	Vegetation Burn Severity (VBS) Mapping by MOF		
	High %	Medium %	Low %
Tributary North of Quilpituk	1.7	21.5	8.1
Quilpituk Creek	7.2	72.5	17.4
Tributary Q1	10.3	75.7	12.5
Tributary at Nahun	5.7	65.2	25.1
Tributary at Caesar's Landing	5.5	53.7	28.0
Tributary Q4	0.7	20.8	15.2

IMPACTED WATERSHED SUMMARY:

In this section, summary comments are provided on the most relevant post-wildfire natural hazards that are expected to pose a risk to the key elements in the study area. Other fire-related hazards may exist which have not specifically been addressed at this level of reconnaissance assessment, but they are considered to pose less risk. These summary comments provide the rationale for the partial risk analysis presented in the next section.

Quilpituk Creek

Almost the entire (97%) Quilpituk Creek catchment was burned, with 80% burned at moderate to high vegetation burn severity. Areas of high burn severity are found within the catchment below Bald Range Road (see Photo 5). The field review confirmed that in these areas, as well as much of the area mapped as moderate burn severity, fire consumed organic duff layers, exposing mineral soils on moderate to steep slopes. Discontinuously strong (high) soil-water repellency was also observed but decreases in areas where surficial materials are coarse colluvium. These conditions suggest a high likelihood for greater and faster surface runoff, shallow instability, and surface erosion over the next 5 years post-fire.

The Quilpituk Creek catchment's headwaters flow down a steep bedrock ridge before reaching a broad low-gradient bench. To the immediate south, the broad bench drains into a tributary of Bald Range Creek, forming a catchment divide for the smaller catchments in the study area. Quilpituk Creek and a tributary channel have stream crossing sites along the Bald Range Creek Road (at ~22.5 km and ~23 km). Although dry at the time of assessment, both indicate ephemeral stream flow by staining in the culverts and have small, overgrown, sediment deposits above the road. Downslope of the road, the gullies deepen and become larger in size. There is another road crossing site on Quilpituk Creek at ~560 m elevation that was not easily accessed and was not inspected during the field review.

Immediately upslope of Westside Road the stream channel is 30% gradient and confined within a deep gully with steep (80-90%) side slopes. At Westside Road, there are two culverts (500 mm and 600 mm) to accommodate flows on Quilpituk Creek (see Photo 6). The channel and gully continue downslope of Westside Road onto a small fan area (see Photo 7). Along the south edge of the fan, before reaching Okanagan Lake, there are signs of scour/erosion by high water flows. There are several structures on private property located on the fan area. However, the primary residence appears to be situated upslope from the channel on the north side of the fan. Further assessment of the fan area is needed to determine how well-incised the channel is and whether there is potential for avulsion.

Other Tributaries and Face Unit Slopes

Small tributary catchments and face unit slopes are located north and south of Quilpituk Creek. The catchment boundaries are ill-defined and the associated ephemeral streams flow through hummocky and rocky terrain, with flow paths that are difficult to resolve by imagery and/or topographic mapping. Based on the predominantly rocky slopes that are benched along upper reaches, the sediment supply appears limited. Post-wildfire natural hazards are more likely to generate on the upper slopes where burn severity is moderate to high. Lower elevation slopes experienced low severity burn and retain vegetation and ground cover that may offer a buffer to downslope areas. Thus, processes such as sediment-laden runoff are unlikely to generate downslope hazards capable of damaging Westside Road and/or private property located below the road. Although the likelihood of post-wildfire debris flow hazard is low, these higher magnitude events have the potential to run out further and may potentially reach Westside Road, and properties located downslope.

Key characteristics of the small tributaries and face unit slopes and the associated post-wildfire natural hazard risks are as follows:

- **Tributary North of Quilpituk** – the catchment north of Quilpituk is characterized by benched, irregular topography, with numerous trails and roads throughout. Only a small portion (31%) of the catchment was burned in 2026, and approximately half of the catchment was burned in 2009. The mainstem stream channel is not well-defined until reaching a short gully above Westside Road. It is likely that runoff flows along short slope segments and infiltrates and flows subsurface through the benched terrain, eventually reaching Westside Road. Flows are sufficient to warrant two culverts at Westside Road (500 mm and 700 mm diameter). Based on a low percentage area burned there is unlikely to be an incremental increase in runoff attributed to the 2026 Fire. There is no fan area below Westside Road and, although the north corner of a private lot extends to the area, there are no visible built structures (RDCO SHIM mapping reports an old cabin).
- **Tributary Q1 and Tributary at Nahun** – the upper elevation channels are not well defined but become more incised upslope of Westside Road. Along Westside Road the mapped MOTT culverts do not line up with the “blue-line” streams (from the BC Watershed Atlas). These discrepancies were not field confirmed at this level of assessment. Due to the percentage burned at moderate and high burn severity (96 to 98%) there may be an incremental increase in surface runoff that may be capable of generating sediment-laden flows over the short term. Due to the lack of defined stream channels and discontinuous flow paths along the slope it is unlikely that there would be sufficient flow energy to generate a post-wildfire debris flow. Connectivity of the channels with Westside Road is unclear, however, the road is situated along the toe of the slope through these two catchments, and the adjacent face units. There is also a lack of defined connectivity between the upslope channels and the private properties located downslope.
- **Tributary at Caesar’s Landing** – this tributary catchment has an area of 1.1 km² and 87% was burned in 2026, with 59% at moderate and high burn severity (see Photo 8). This level of burn is sufficient to impact catchment hydrology, including runoff rates and water yield (due to loss of vegetation cover that would normally intercept precipitation). The ephemeral stream originates at a small lake above Bald Range Creek Road and occupies a shallow swale before reaching hummocky bedrock topography. The channel is not well-defined and appears discontinuous before reaching a bedrock gully that extends a short distance (650 m) upslope of Westside Road. Along Westside Road, based on limited field review, there is no visible channel and no detected MOTT culverts (although the mapping does indicate the presence of culverts). There may either be a flow deflection upslope, or the tributary flows infiltrate and then flow subsurface. There is a transition from shallow bedrock to thick glaciofluvial and glaciolacustrine sediments at the south end of the study area. If flows go subsurface there is a likelihood that changes in groundwater flows will affect downslope stability. Downslope of the mapped tributary, along the shoreline and on private property, there is a large landslide feature (see Photo 9). The slide is a deep-seated slump measuring almost 100 m wide and 100 m long. According to historical google

earth imagery and from reporting provided by RDCO, slope movement accelerated after 2016, which potentially coincides with extremely high lake levels in 2017 and a high spring runoff year in 2018. Based on uncertainty with regards to driving mechanisms, post-wildfire changes in catchment water yield and groundwater discharge may contribute to an incremental increase in slope instability.

- **Tributary Q4** – Tributary Q4 is a short first-order stream segment that was not extensively burned (37% area) and only 22% at moderate to high burn severity. There is land modification (land clearing, levelling, cut & fill) along the downslope reaches of the tributary above Westside Road; an area of future land development. The stream reach in this segment becomes subsurface and there is no indication of surface flow through the area, nor are there observed historic debris flow deposits. Due to the relatively small area burned and the low severity of burn, the catchment is unlikely to experience changes in runoff. Drainage paths within the catchment are not well-defined and do not appear to reach Westside Road. Runoff infiltrates and becomes subsurface above Westside Road.

SUMMARY OF POST-FIRE HAZARD AND RISK

1. Hazard = $P(H)$, the probability of occurrence of a hazardous event
2. Probability of spatial impact, $P(S:H)$, the probability of a hazard reaching or affecting an element at risk
3. Partial Risk, the probability of a hazard occurring and affecting an element at risk = $P(H) \times P(S:H)$
- 4: Location with the highest risk rating given; at other locations the risk may be lower

The following section provides partial risk summary tables for the study area catchments, followed by brief rationale for the ratings. Further details regarding the hazards of concern, the factors influencing their likelihood of occurrence and the potential for impacting elements at risk are provided in the preceding section.

Quilpituk Creek – Partial Risk to Private Property (Residence) Located on Fan

Including: 5875 Westside Rd. (PID 001-767-291)

Hazard Type	Probability of Hazard $P(H)$	Probability of Spatial Impact $P(S:H)$	Partial Risk
Small-scale sediment-laden flooding	High	High	Very High
Debris Flood or Debris Flow	High	High	Very High

Quilpituk Creek – Partial Risk to Westside Road

Hazard Type	Probability of Hazard $P(H)$	Probability of Spatial Impact $P(S:H)$	Partial Risk
Small-scale sediment-laden flooding	High	High	Very High
Debris Flood or Debris Flow	High	High	Very High

The reconnaissance level assessment indicates a high degree of vegetation and soil burn severity, together with water repellent soils, in the upslope catchment of Quilpituk Creek. The likelihood for post-wildfire natural hazards is incrementally higher as a result. The probability of small-scale sediment laden flooding, and for debris flood or debris flow, is considered HIGH.

The creek becomes well-confined within a bedrock-controlled gully that extends downslope to Westside Road and beyond to a small fan area on Okanagan Lake. Because exact structure locations on the fan are unconfirmed, the spatial likelihood of impact to the private property located on the fan, downslope of Westside Road, is considered HIGH for small-scale sediment-laden flooding and for debris flood/debris flow. The spatial likelihood of impact to Westside Road is considered HIGH for both hazards. Thus, the partial risk of impact by post-wildfire natural hazards is rated VERY HIGH for all identified elements at risk based on the information gathered at this level of assessment.

Other Tributaries and Face Unit Slopes – Partial Risk to Private Properties Located Below Westside Road

Including: Vacant parcel (PID 006-497-365), 5625 Westside Rd. (PID 008-305-081), 5495 Deighton Rd. (PID 025-051-229), Vacant (PID 006-481-370), 5000 Westside Rd. (PID 001-468-316), Vacant 4400 Westside Rd. (PID 024-086-436), Vacant Lots @ 4400 Westside Rd. (multiple PIDs), 4625 N Westside Rd. (PID 024-666-424)

<i>Hazard Type</i>	<i>Probability of Hazard P(H)</i>	<i>Probability of Spatial Impact P(S:H)</i>	<i>Partial Risk</i>
<i>Small-scale sediment-laden flooding</i>	<i>Moderate</i>	<i>Low</i>	<i>Low</i>
<i>Debris Flood or Debris Flow</i>	<i>Low</i>	<i>Low</i>	<i>Very Low</i>
<i>Deep-Seated Landslide Stability (for Trib. at Caesar's Landing only)</i>	<i>Moderate</i>	<i>Low</i>	<i>Low</i>

Other Tributaries and Face Unit Slopes – Partial Risk to Westside Road

<i>Hazard Type</i>	<i>Probability of Hazard P(H)</i>	<i>Probability of Spatial Impact P(S:H)</i>	<i>Partial Risk</i>
<i>Small-scale sediment-laden flooding</i>	<i>Moderate</i>	<i>Moderate at base of gullies</i>	<i>Moderate</i>
<i>Debris Flood or Debris Flow</i>	<i>Low</i>	<i>Moderate</i>	<i>Low</i>

Due to the percentage burned at moderate and high burn severity, the likelihood of a post-wildfire sediment-laden flow is considered MODERATE for each of the small tributaries, except for Tributary Q4. However, the likelihood of a post-wildfire debris flow event being generated along the small channels is considered LOW due to the lack of defined channel and discontinuous flow paths along the slope.

Connectivity of the channels with Westside Road is unclear but, due to the proximity of the road to the toe of the slope, the likelihood that an event would reach, and impact, Westside Road is considered MODERATE. This is especially so at the base of any gully or swale intersecting the road, whether at a defined tributary or along the

base of a face unit. The spatial likelihood of impact to private properties downslope of Westside Road is considered LOW because of lack of connectivity to the upslope channels and slopes.

For the Tributary at Caesar's Landing, deep-seated landslide stability is an additional identified hazard. Due to a potential for post-fire incremental increase in water yield, the potential for changes to deep-seated landslide stability is rated MODERATE. Consultation with RDCO indicates that previous assessment work on the property has determined safe setback distances for structures. Therefore, the spatial likelihood of impact is rated LOW and the resultant partial risk is LOW.

Based on the results of the assessment, the partial risk of sediment-laden flow to properties below Westside Road is rated LOW and the partial risk of debris flow to properties below Westside Road is VERY LOW. The partial risk of sediment-laden flooding to Westside Road is rated MODERATE and the partial risk of debris flow to Westside Road is LOW.

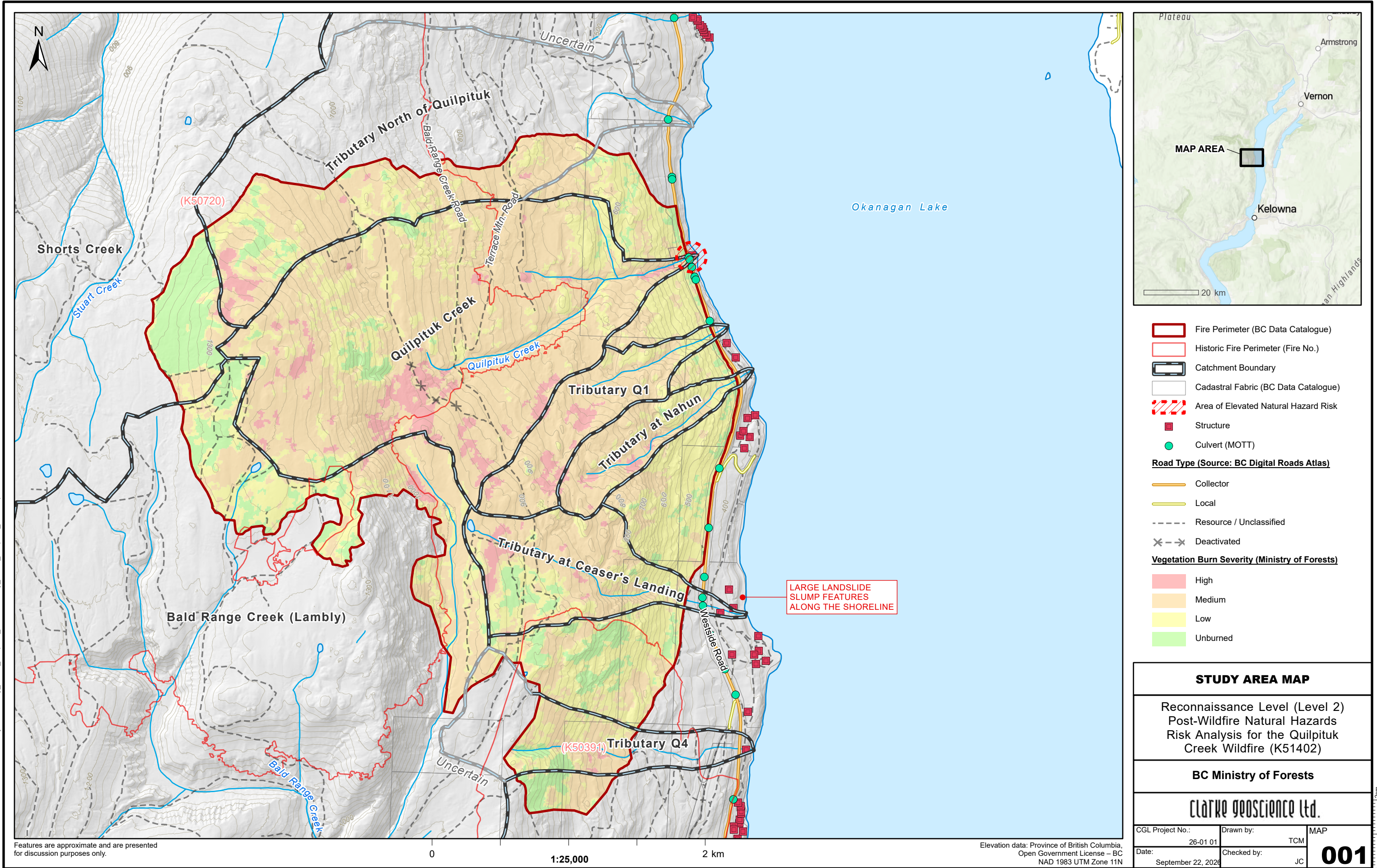
For Tributary Q4, because of the low percentage area burned (37%) and the low severity of burn, the likelihood of post-wildfire sediment-laden flow or debris flow within the Tributary Q4 catchment is considered LOW. The spatial likelihood of impact to Westside Road and to downslope properties is considered LOW due to the lack of channel connectivity and highly permeable sediments. Thus, the partial risk rating to downslope elements at risk is VERY LOW.

FURTHER ACTIONS:

- RDCO should provide a link to the PWNHRA report (or to the PWNHR Hub at <https://pwnhr-bcgov03.hub.arcgis.com/pages/assessments-explorer>) on their website and distribute and post the Provincial pamphlet regarding *Landslide and Flooding Risks due to Wildfires* (attached)
- MOTT should install signage along Westside Road notifying the public of potential post-wildfire hazards related to the Quilpituk Creek Fire.
- RDCO should inform property owners and residents situated downslope of the fire perimeter to have an increased level of awareness of natural hazards, regardless of the risk level assigned in this report. Natural hazards include increases in stream flow, groundwater flow, sediment-laden flows, and potentially damaging debris flows. Post-wildfire hazards are most likely to occur within the first 5-years after the fire. However, elevated hazard conditions may persist for decades within highly impacted and highly vulnerable watersheds.
- RDCO should request that upslope natural hazards attributed to post-wildfire conditions be addressed in future Geotechnical Reports provided with Development Permit or Building Permit applications.
- More detailed assessment of watershed conditions and debris flow hazard is recommended for Quilpituk Creek and to confirm connectivity of the lower reaches of the smaller affected catchments. For these areas, a Level 4 Detailed PWNHRA is recommended to be undertaken by the Ministry of Forests.
- Upon completion of a detailed assessment, the responsibility for undertaking recommended mitigation measures is that of the property owner or local governing authority.
- As soon as possible, and prior to winter, road and drainage infrastructure inspection and maintenance activities should be carried out along the permitted access roads in the fire-affected area and fireguards should be decommissioned or deactivated to restore natural drainage patterns.

SIGNATURE, SEAL, FIRM PRACTICE #  JAC 9/22/26 Jennifer Clarke, M.Sc., P.Geo. – Senior Geomorphologist Clarke Geoscience Ltd. Permit to Practice #1000143 Reviewed by: Tedd Robertson, P.Geo., P.L.Eng. – Senior Geomorphologist Sitkum Consulting Ltd.	ATTACHMENTS: 1. Map 001 2. Appendix A – Hazard and Risk Analysis Methodology 3. Appendix B – Photos 4. Pamphlet – <i>Landslide and Flooding Risks due to Wildfires</i>
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Appendix A – Hazard and Risk Analysis Methodology for PWNHRA Reconnaissance Level 2 Reports

Scope of Level 2 Reports

Reconnaissance (Level 2) reports are primarily intended to identify whether post-wildfire hazards are likely to occur and need detailed investigation to protect identified elements at risk. Identified elements at risk are generally limited to public safety and infrastructure. Reconnaissance reports may also be used to assess safety conditions for wildfire fighters. In some cases, the MOF District Manager or other MOF personnel may request assessments for non-standard elements at risk or for other reasons.

Definitions of Hazard and Risk

Wildfire may produce conditions conducive to a suite of hazards. Debris flows, debris floods, and floods are often the most important hazards, but other types of landslide hazards including rockfall, debris slides and earthflows can also occur in response to wildfire. Wildfire can also cause snow avalanches and may affect water quality, cause erosion and result in sedimentation. Terrain, watershed, and channel conditions that produce post-wildfire hazards may also produce similar hazards in unburned conditions; these hazards may be mentioned but are not evaluated in this report.

Hazard $P(H)$, spatial likelihood $P(S:H)$ and partial risk are presented for each identified elements at risk. Multiple types of channel hazards (debris flows, debris floods, floods) may affect an element at risk. These hazards are ranked by severity, with debris flow as the most damaging and destructive and flood as the least damaging and dangerous, and ratings are given for the highest rating hazard that may affect an element at risk. For example, where a channel has the potential for a debris flow and an element at risk may be affected, the lower ranking debris flood and flood hazards are not rated, since discharge and velocity are likely to be less than for a debris flow. These processes may cause erosion or sedimentation that affects the element at risk. Hazards that are unlikely to affect an identified element at risk are not discussed.

Table A1 shows the annual probability ranges for qualitative definitions of $P(H)$. The probability of the hazard occurrence is for the post-wildfire period of elevated hazard, which in many cases may be less than five years, but in some cases may extend for several more years.

Table A1. Qualitative descriptions of post-wildfire hazard likelihood, hazard criteria, and related quantitative probabilities.

Hazard Likelihood Rating [P(H)]	Description	Annual Probability Range (Return Frequency)
Very High	An event is expected to occur. Most of the catchment or face unit has burned with a significant proportion burned at moderate and/or high severity	>20% (> 1:5)
High	An event is probable under adverse conditions. Most of the catchment or face unit has burned with a significant proportion (i.e., >50 %) of terrain conducive to post-wildfire natural hazard initiation burned at moderate or high severity. Existing indicators of pre-fire terrain instability within stream channels, on fans or face units.	1% to 20% (1:100 to 1:5)
Moderate	An event could occur under adverse conditions. It is not probable but possible over a several year period. More than 20% of the terrain conducive to post-wildfire natural hazards in the catchment or on the face-unit has burned with moderate and/or high severity. Historic geomorphic indicators of instability are present.	0.2% to 1% (1:500 to 1:100)
Low	An event could occur under very adverse conditions. It is considered unlikely over a several year period. Only a limited proportion of the catchment or face unit has burned. Few or no signs of pre-fire instability present along stream channels, fans or face units.	0.04% to 0.2% (1:2,500 to 1:500)
Very Low	An event will not occur or is conceivable though considered exceptionally unlikely. A limited proportion/none of the catchment was burned. No terrain instability indicators are present	<0.04% (< 1:2,500)

Table A2 defines spatial impact to an element of risk. Post-wildfire event magnitude is considered when rating spatial impact.

Table A2. Post-wildfire spatial impact.

Likelihood of spatial impact	Description	Probability range
H	It is probable that the event will impact the element at risk.	> 50%
M	It is possible that the event will impact the element at risk.	50% to 10%
L	It is unlikely that the event will impact the element at risk.	< 10%

Table A3 is a matrix which combines the hazard likelihood (Table A1) with the spatial impact likelihood (Table A2) to determine partial risk.

Table A3. Post-wildfire risk matrix partial risk matrix.

Hazard Likelihood P(HA) (Table 1)	Spatial Impact Likelihood (P(S:H)) (Table 2)		
	High	Moderate	Low
Very High	Very High	Very High	High
High	Very High	High	Moderate
Moderate	High	Moderate	Low
Low	Moderate	Low	Very Low
Very Low	Low	Very Low	Very Low

Report Standards

FLNRORD Land Management Handbook 69 is the primary standard followed in this report. LMH 69 describes the process to complete a detailed report. This reconnaissance report uses the framework of LMH 69 but does not follow it where detailed assessment procedures are described.

Land Management Handbook 69 Post Wildfire Natural Hazards Risk Analysis in British Columbia 2015

<https://www.for.gov.bc.ca/hfd/pubs/Docs/Lmh/Lmh69.htm>

Additional guidance is provided in the MOF SOG for PWNHRA and the 2014 FLNRO Landslide Risk Management Procedure.

Other professional guidance standards that may be used for the preparation of reconnaissance reports are listed below. These guidelines have similar report content to this reconnaissance assessment, but are for different purposes, have different levels of appropriate effort, and do not recognize the potential emergency nature of this reconnaissance assessment. These guidelines include:

EGBC Guidelines for TSA in the Forest Sector 2010

<https://www.egbc.ca/getmedia/684901d7-779e-41dc-8225-05b024beae4f/APEGBC-Guidelines-for-Terrain-Stability-Assessments.pdf.aspx>

EGBC Guidelines for Legislated Landslide Assessments 2010

<https://www.egbc.ca/getmedia/5d8f3362-7ba7-4cf4-a5b6-e8252b2ed76c/APEGBC-Guidelines-for-Legislated-Landslide-Assessments.pdf.aspx>

Legislated Flood Assessments in a Changing Climate in BC 2018

<https://www.egbc.ca/getmedia/f5c2d7e9-26ad-4cb3-b528-940b3aaa9069/Legislated-Flood-Assessments-in-BC.pdf>

Watershed Assessment and management of hydrologic and geomorphic risk in the Forest Sector

<https://www.egbc.ca/app/Practice-Resources/Individual-Practice/Guidelines-Advisories/Document/01525AMW2ATQA5BSODHJAKBAGZDYTRL6FJ/Watershed%20Assessment%20and%20Management%20of%20Hydrologic%20and%20Geomorphic%20Risk%20in%20the%20Forest%20Sector>

Other standards may also apply, depending on the professional qualifications of the writer.

Statement of Limitations

Reconnaissance PWNHRA Level 2 assessments are typically done in constrained timelines where personnel, resources, data collection, and analysis methods are limited. Post-wildfire hydrogeomorphic hazards in BC are an emerging science and therefore hazard and risk assessments are estimates only. While probabilities ranges are given in Tables A1 and A2, the state of the science in BC does not allow for precise assessments, particularly near the borders of classes. Numeric probabilities ranges do not imply precision.

Identification of elements at risk relies on BC government data layers, satellite imagery, and perhaps an overview flight. BCWS and the MOF district office may provide additional information. No further confirmation of elements at risk was conducted and is beyond the scope of this level of assessment.

Comments, conclusions, and recommendation contained in this reconnaissance assessment reflect experience and judgement considering the information available at the time that this report was prepared and are considered appropriate for the reconnaissance nature of the review. The review has been carried out in accordance with generally accepted professional practices. This assessment and its contents are intended for the sole use of post-wildfire hazard management by provincial agencies, First Nation governments and local governments. We do not accept any responsibility for the accuracy of any of the data, the interpretation, or the conclusions contained or referenced in the report when the report is used or relied on for any other purpose than specified. Any such unauthorized use of this report is at the sole risk of the user.

APPENDIX B – SELECT PHOTOS of QUILPITUK CREEK WILDFIRE STUDY AREA (Aug. 28 & Sept. 9, 2026)



Photo 1: View (south) of Quilpituk Creek gully extending down to Westside Road and the small fan area on Okanagan Lake. Linear feature upslope of Westside Road is the Fortis power transmission line.

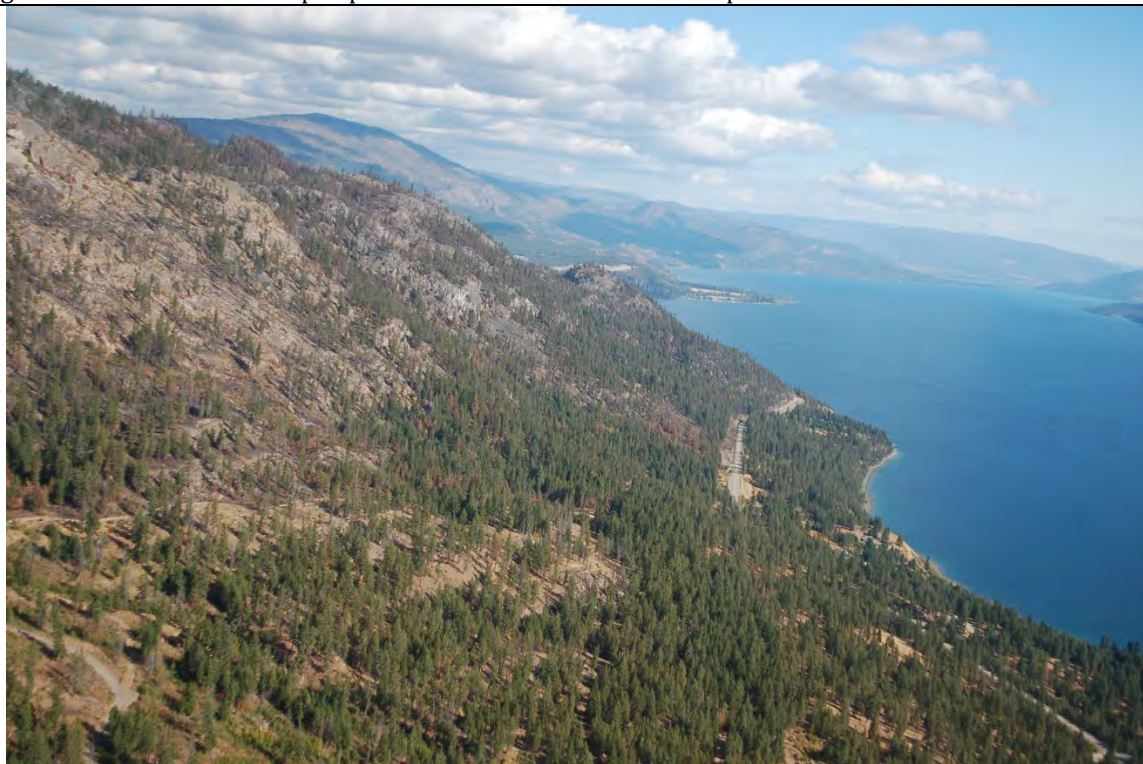


Photo 2: View north along face unit slopes between Ceasar's Landing and Nahun (incl. Tributary at Ceasar's Landing and Tributary Q4 showing unburned to low vegetation burn severity along lower slopes.



Photo 3: View north from the southern fire perimeter showing the southern Tributary Q4 and adjacent slopes that were previously burned in 2015 Shelter Cove Fire. Vegetation burn severity is none (unburned) to moderate. Fireguard along south perimeter is visible.



Photo 4: Moderate vegetation burn severity slopes in the Quilpituk Creek catchment. Soil burn severity is higher, with discontinuous water-repellent soils.



Photo 5: View (west) of the burned upper slopes of the Quilpituk Ck catchment. Bald Range Creek Road (and fireguard) traverses the catchment at ~920 m elevation. An area of high vegetation burn severity is outlined.



Photo 6: Quilpituk Creek culvert outlets (500 mm and 600 mm diameter) at Westside Road, view downstream. Note the deep channel scour indicative of high flow conditions. Only a small trickle (<0.5 litres/sec) of water was flowing at the time of the field assessment.



Photo 7: Lower Quilpituk Creek and fan area situated below Westside Road (outlined). Note the burned canyon slopes upslope of Westside Road. Note the private property on small fan below Westside Road.



Photo 8: View east from Bald Range Creek Road (~900 m elev.) near headwaters of Tributary at Caesar's Landing. Note bedrock slopes and irregular hummocky topography and thin soil cover. Low to moderate vegetation burn severity is observed.



Photo 9: Private property downslope of Westside Road near undefined outlet of Tributary at Ceasar's Landing. There were no observed culverts along Westside Road at the mapped channel path. However, there are nearby culverts that could be receiving runoff from the upslope catchment. Note the large landslide slump features along the shoreline (circled).

4 WHAT should you do during a storm or heavy runoff event?

- ▶ Pay attention to weather forecasts that include thunderstorm or heavy rainfall warnings.
- ▶ Check the current Environment Canada weather forecast at http://weather.gc.ca/canada_e.html
- ▶ Avoid driving in an area where a wildfire has recently occurred. Potential dangers include washed-out bridges and culverts. Roads running below steep banks are susceptible to landslides. If it's absolutely necessary to travel in the area, stay alert and watch the road ahead of you for collapsed pavement, mud, fallen rocks or other indications of debris flows.
- ▶ Never drive across a flooded road.
- ▶ If your home is in an at-risk area and severe weather is occurring or in the forecast, stay alert. Listen for any unusual sounds (e.g. tree trunks cracking or boulders knocking together) and watch for changes to water flows in local stream channels. Consider sleeping on an upper floor of your home and don't sleep in the basement.
- ▶ Do not enter water channels or hike upstream to inspect water lines or buildings. Consider leaving the area temporarily if you are concerned (and if it is safe to do so).
- ▶ On forested land where a wildfire has recently occurred, avoid camping on floodplains, beside small streams, on alluvial fans or at the base of burned slopes. Be aware that forest service roads or resource roads may wash out if a flood occurs and could cut off access to the area.

How long do post-wildfire risks last?

In areas that have been severely burned, post-wildfire risks may last for two years or more. However, the increased risk of floods or debris flows in severely burned areas may persist much longer.

After two or three years, the regrowth of vegetation and reduced water repellency of the soil should lower the risk considerably.

How can you get more information about potential risks to your property?

Consulting geotechnical specialists can provide specific information about your property and post-wildfire hazards, including potential risk-mitigation techniques.

This bulletin provides general information only and does not cover all potential hazards. Additional information resources are available online:

- ▶ Current wildfires: www.bcwildfire.ca
- ▶ Association of Professional Engineers and Geoscientists of B.C. (APEGBC): www.apeg.bc.ca/Home
- ▶ Environment Canada weather: http://weather.gc.ca/canada_e.html
- ▶ Current flood information, Emergency Management BC information and contacts: <http://www.embc.gov.bc.ca/index.htm>
- ▶ Ministry of Forests, Lands and Natural Resource Operations district offices and contacts: www.gov.bc.ca/for



Landslide and Flooding Risks DUE TO WILDFIRES

*What you can do to recognize
and deal with the hazards*

The large Terminal Creek mudslide near Squamish occurred during a localized rainstorm in September 2015, stranding recreationalists.



There was widespread flooding on the Squamish River after a severe rainstorm in September 2015.



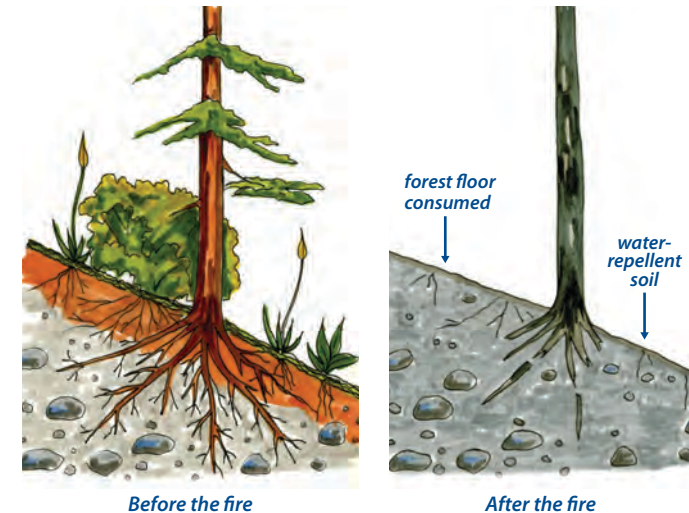
Ministry of
Forests, Lands and
Natural Resource Operations



Part of the Elaho River drainage area was burned by wildfire in 2015.



This is the Elaho drainage area in June 2015, showing evidence of how severe the wildfire was in that area.



Wildfires remove the protective ability of vegetation, increasing runoff, erosion, debris flow and the potential for landslides.

INTRODUCTION

This pamphlet describes how wildfire activity may increase the risk of natural landslides and flooding, the warning signs you should watch for, and what you should do in an emergency. This information can help you and your family avoid a potentially dangerous situation.

1 HOW does wildfire activity increase the risk of landslides and flooding?

Periodically, British Columbia experiences severe wildfires near populated areas, such as those that occurred in 2003, 2009, 2010 and 2015.

A severe wildfire damages the forest canopy, as well as the smaller plants and soil below the trees. This can result in increased runoff after intense rainfall or a rapid snowmelt, putting homes or other structures below the burned area at risk of localized floods and landslides.

2 WHAT specific hazards should you watch for after a wildfire?

- ▶ **flooding**, especially after an intense rainfall
- ▶ **landslides**, which could include a:
 - » debris flow (a specific type of fast-moving and powerful landslide, resulting from heavy water runoff and carrying large amounts of soil, rocks, wood debris and trees)

- » rockfall (resulting from the fire-induced cracking of rocks and the loss of stumps, logs and roots that would normally hold loose rocks in place)

What values could be put at risk?

- ▶ **Residential**, farm and industrial buildings that are downslope or downstream of the site of a severe wildfire could be affected by post-wildfire hazards, even if the fire was only one or two hectares in size.
- ▶ **Structures** that are located below a recent wildfire and are near a creek, gully or alluvial fan are most at risk.
- ▶ In an area that has experienced flooding or landslides in the past, there is an increased likelihood that a flood or landslide could happen there again.
- ▶ **Roadways**, railway lines, pipelines and other types of infrastructure (including bridges that are downslope or downstream of a wildfire) may be obstructed, inundated or washed out.
- ▶ **Domestic water lines**, irrigation water lines and water intakes (and other structures in gullies, streams or creeks) could be damaged or destroyed by a post-wildfire flood or landslide. These areas may be at risk during these events but also after them, due to water channel blockages.

What weather conditions trigger post-wildfire floods and debris flows?

The most common trigger is intense rainfall (e.g. 10mm of rain falling in under 30 minutes). The risk increases if the rainfall follows a prolonged dry period, because water can't soak into

dry, fire-altered soils quickly. The water is repelled and flows over the land, instead of soaking into it.

In coastal areas, fall rainstorms are the most likely causes of post-wildfire floods or debris flows. A rapid spring snowmelt can also be a trigger in drainage areas that have experienced severe wildfires.

3 HOW can you deal with post-wildfire hazards?

- ▶ **Be informed. Be ready.**
- ▶ **Familiarize** yourself with the landscape and its normal drainage channels. Know where your home or property is situated with respect to natural drainage channels. Find out if any floods or landslides have occurred in the area in recent years.
- ▶ **Contact** local authorities to learn about any emergency response and evacuation plans for your area. Attend any meetings that are held to inform the public of local risks.
- ▶ **Develop** your own emergency plans for your family, property and/or business. Post-wildfire hazard events can occur with little advance warning, so it's important to be prepared.
- ▶ If a wildfire occurs on Crown (provincially owned) land, a post-wildfire risk analysis may be conducted to determine if the safety of nearby residential areas may be affected. **Contact your local government** office or Emergency Management BC (EMBC) to see if a risk analysis has been done in your area.