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Sea to Sky Community Services
c/o CPA Development Consultants Inc.
100-283 East 11th Avenue
Vancouver, BC V5T 2C4

November 4, 2021
File: 1706

Attention: Mr Casey Clerkson

**RE: Preliminary Flood Hazard Review Report, Proposed Mixed-Use Development,
Lot 2 Harrow Road, Pemberton, BC**

1.0 INTRODUCTION

It is proposed to construct an affordable housing project at Lot 2 Harrow Road in Pemberton, BC which has the legal lot description LOT 2 DISTRICT LOT 203 LILLOOET DISTRICT PLAN KAP56640.

We have reviewed the conceptual drawings prepared by Station One Architects dated August 30, 2021 and the site survey prepared by Bunbury and Associates dated October 6, 2021 in preparing this report. We understand that a four or five level building is being considered. Both building options are proposed to be at grade with a full or partial level of commercial space on the first floor and residential housing above. The site is located within the Lillooet River floodplain therefore a flood hazard exists.

This report presents our review of the flood hazard defined by others, provides a recommendation for a 200-year flood construction level (FCL), and provides geotechnical recommendations related to flooding.

There are other geohazards which could affect the site which have not been considered herein and should be addressed by others, as assessing these are beyond the scope of our engagement.

This report has been prepared exclusively for Sea to Sky Community Services, for their use, and the use of others on their design team and for the Village of Pemberton in the permitting process however, it remains the property of Frontera Geotechnical Inc.

2.0 SITE DESCRIPTION

The property is located on the east side of the main Village of Pemberton and is the lot directly adjacent to the intersection of Pemberton Portage Road and Harrow Road. The site is bound by acreages to the east and residential developments to the north. The site is bound to the south by Highway 99 and across the highway is the Pemberton Valley Lodge Hotel.

The site is an irregular triangular shape and is generally flat with grades ranging from approximately 206.0 m at the east and west ends of the site and up to 207.1 m geodetic elevation at the highest point near the centre of the property according to the survey.



3.0 FLOOD HAZARD REVIEW

3.1 Recommended FCL

We have based our FCL determination on the Lillooet River Floodplain Mapping Report prepared by Northwest Hydraulic Consultants Ltd. (NHC), dated November 2018, for the Pemberton Valley Diking District (PVDD) and the Squamish-Lillooet Regional District (SLRD). Review of the documents indicates that the flood surface elevation at the building location ranges from approximately 209.05 to 209.25 metres geodetic.

EGBC 2018, defines the FCL as the design flood level plus an allowance for freeboard. The Lillooet River Floodplain Mapping Report recommends that no additional freeboard be applied to the values presented on the flood mapping as 0.6 m of freeboard was included in their recommendations. Therefore, our recommended FCL for this project is 209.25 m.

Provincial guidelines, best practices, and Frontera recommend that all habitable space be located above the FCL. In the context of flood assessments habitable space typically includes any area used for living, commercial use, or storage of goods damageable by floodwaters. In habitable areas, the top of any concrete slabs-on-grade or the underside of wooden floor systems should be located above the FCL. Typically, building areas located below the FCL are limited to entry foyers, crawl spaces and garages. Any major electrical equipment or mechanical equipment should be located above the FCL.

3.2 Site-Specific Exemption

The site grades range from approximately 206.0 to 206.5 metres geodetic elevation around the edges of the property and are at the highest at 207.1 near the centre of the lot. Based on the review of the available documents, the flood depth for a 1 in 200-year flood event is estimated to be up to approximately 2.0 m to 2.5 m across the site. However, in more frequent but less significant flood events, the flood depth across the site could range between 1.0 m and 1.5 m for a 1 in 100-year event or between 0.5 m to 1.0 m for a 1 in 50-year event.

In order to achieve the FCL for all habitable space, up to 3 m of fill would be required or the ground level could be used as a parkade with a small entrance foyer. Therefore, we understand that a site-specific exemption is being sought to allow for commercial and amenity space to be located on the first level, below the FCL. We understand that similar exemptions have been granted for other projects in Pemberton and that the Village may be supportive provided that the building is deemed to be safe for the intended use by a qualified professional.

We understand all residential space will be located above the FCL on the upper levels of the building. If non-residential uses are permitted to be below the FCL, the building must incorporate the following design requirements.

1. Major fixed equipment including major electrical switchgear, furnaces, ventilation systems and hot water tanks that are integral to and necessary for the functioning of a building according to the BC Building Code are located above the FCL.
2. All elevators have an automatic shut-off to prevent occupants from inadvertently descending into an inundated area.
3. Portions of the structure located below the 1 in 200-year floodplain should maintain some level of resilience against lesser flood events or overland flow. Therefore, we recommend that at a minimum the building slab be at least 0.3 m above the crown of the fronting roads. Based on the available survey, this would result in a slab elevation of at least 207.5 m geodetic elevation.



Provided the recommendations specified above are incorporated in the design, the Village of Pemberton may consider a site-specific exemption to allow for commercial and amenity space to be located below the flood construction level.

Ultimately, it is up to the Village of Pemberton to decide if a site-specific exemption is in their best interest. Frontera would be in a position to provide an assurance on safety as defined in Section 4 of this report.

3.3 Further Considerations

Frontera Geotechnical Inc. will not accept any liability resulting from damage to goods or equipment, or structures constructed below the FCL. This letter should be registered as a covenant on the title and should be made available to future building tenants.

The portions of the structure located below the FCL will be subject to flooding and therefore the owner and any future tenants of the property must be made aware of this risk and should fully appreciate that the portion of the building below the FCL would be subject to flood damage, any contents or stored goods within these areas would be subject to flood damage, and that following major flooding a significant restorative effort would likely be required.

Much of the surrounding area would likely be cut off from access and safe egress during extreme flood events. We recommend that evacuation of the property be prepared for and implemented at the onset of predicted moderate to large flooding in accordance with Village of Pemberton evacuation procedures.

Interpretation of the flood flow velocities from the hazard ratings provided in the Lillooet River Floodplain Report indicates that the subject site is in an area where flood flows in the range of 0.5 – 1.0 m/s could occur and therefore scour protection is recommended. For these moderate flow velocities, per the Village of Pemberton Flood Management Bylaw, armouring of fill slopes which support foundations is considered necessary. Frontera can design the erosion and scour protection upon request once the final design is complete.

The structural designer must consider the hydrodynamic loading which could be imparted by the flood flow velocities and flood depths described above. The structure must be able to safely withstand these flood flows from a structural design standpoint. The flow velocity should be factored as required by the structural engineer. A statement should be provided by the structural engineer confirming that they have included the effects of flooding in their design.

4.0 CLOSURE

Sections 919.1 and 920 of the Local Government Act contains provisions for a local government to request a report from a professional engineer with experienced relevant to the applicable matter to assist them in determining the conditions or requirements which may be required of a project prior to granting of a development permit. In the context of this report “used safely” is defined to mean that the direct effects of the flood itself are unlikely to cause structural damage so as to prevent egress from the building.

In consideration of the flood hazards described herein, and assuming that the hazard mitigation strategies described above are implemented, we consider that the land may be used safely for the use intended.

Prior to issuance of a building permit a Qualified Professional should be asked to review and confirm that the final design drawings have considered and taken into account the recommendations described in this report.

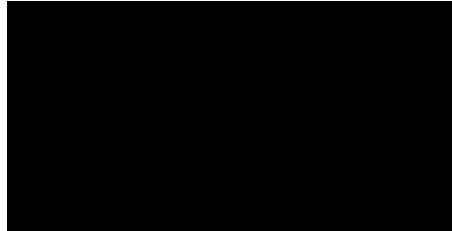


It must be appreciated by all that a risk of flooding exists. If the flood water elevation rises to depths greater than considered herein, for the 1 in 200-year event, or if flood flows are not as expected, damage to the property and any improvements could occur.

Frontera is pleased to be of assistance to you on this project. We trust the foregoing is sufficient at this time.

Yours truly,
Frontera Geotechnical Inc.

Reviewed by:



Will Gerrard, P.Geo.
Geoscientist

Jessica Gagne, P.Eng.
Geotechnical Engineer