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Project Number: SP070621

Re: Updated flood and slope hazard assessment of the northeast portion of District Lot 3668 in the Cheakamus River Valley, 15 km north of downtown Squamish, B.C.

Baumann Engineering originally assessed this site in 1999, and reported their findings in a report dated September 19, 1999. Since that time, at least three other reports dealing with natural hazards in this area have been completed by us.

Figure 1: Overview photograph of the subject property (circled), looking north. The Cheakamus River is at left, and the CN Rail line goes through the centre of the picture. The CN track is located above the Q200 flood level.

It is our understanding that there is now a proposal to expand the existing dwellings on the property, and to use them to provide accommodation for up to 50 people.

With regard to this matter, the following comments are made:

1. The 1999 report concluded that most of the property is on the floodplain of the Cheakamus river, and could be flooded during periods of high water flow. Specifically, at the main house on the north side of Paradise Valley road, flood waters could rise to an elevation of about 61.5 metres during a flood expected to occur on average once every 200 years (a so-called Q200 flood). Provincial legislation requires that inhabited areas of homes be above the 200 year flood level. In this case, the average ground elevation in the immediate vicinity of the main house is about 60.0 metres, and so inhabited areas of building need to be at least 1.5 metres above the ground.

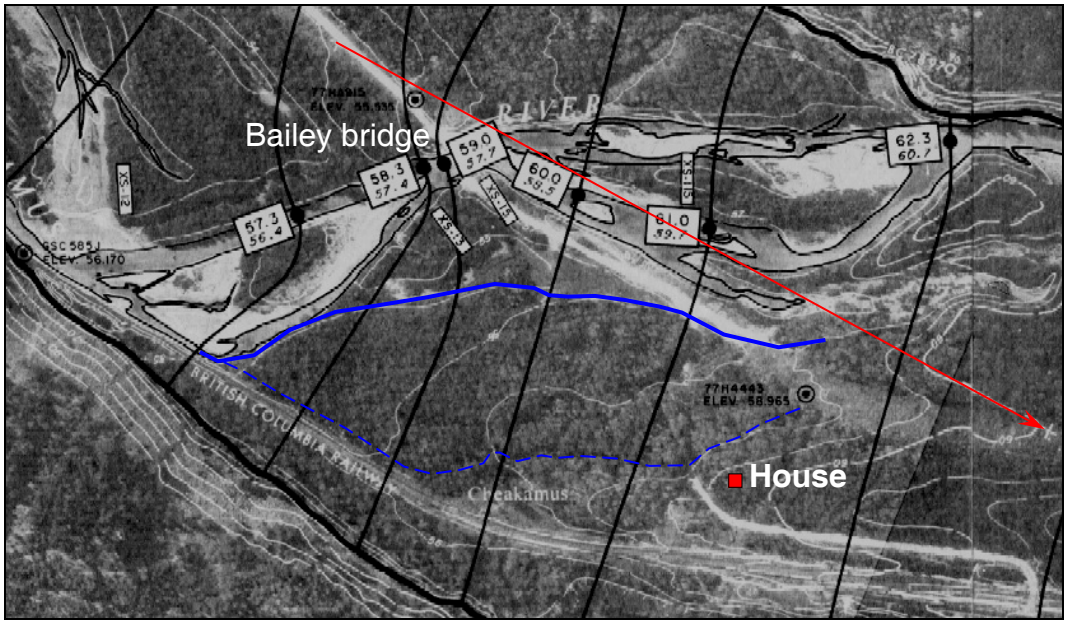

Figure 1: A portion of the Cheakamus River floodplain map showing the location of the main house (red square) on Lot 3668. The arrow points north and is one kilometre long; for reference, note also the location of survey monument 77H4443. The solid blue line is the present long term stable river left (east) boundary of the Cheakamus River. The dashed blue line is a small overflow channel that would only be viable during major flooding events. The solid black lines at the top and bottom of the orthophoto mark the 200 year floodplain limit, and the crossing black lines are flood elevation contours that mark the elevation to which flood waters would rise during a flood expected to occur on average once every 200 years (Q200 flood).

2. In addition to inundation by flood waters, inhabited structures must also be able to resist the forces created by flowing water, and not unduly impede flood flow runoff during a high water event.

3. To deal with flood hazards, it was recommended that inhabited portions of dwellings in this area should be located at an elevation of at least 61.5 metres, and that a concrete foundation, or the equivalent, should be used to provide scour protection.

4. The 1999 report also assessed other slope hazards- specifically, rock slide and rockfall hazards that might affect the property, and concluded that there was no evidence that such events had ever affected the lot, or that any areas of unstable ground that could impact the property are located nearby. Since the 1999 report was commissioned, the presence of a large area of broken rock that may represent a pre-historic landslide has been noted on the hillside east of Midnight Way, just north of the subject property. The origin of this event is unknown, however, it is too far north to be of any concern to the subject property.

5. On April 28, 2000, a field inspection of the property was completed. At that time, house construction was nearly complete, and it was found that construction had substantially complied with all recommendations of the 1999 report. Specifically, it was found that inhabited areas were about 61.8 metres above sea level, or 0.3 metres higher than required, and that the combination of a concrete foundation and sloping berm around the house provided scour protection.

6. On June 18, 2001, an assessment of proposed building sites in the campground area on the south side of Paradise Valley Road was completed. This assessment concluded that this area was also on the floodplain of the Cheakamus River, and established the flood construction elevation, and other measures, needed to mitigate flooding in this area.

7. On October 17, 2003, the Squamish area was hit by a major storm which caused extensive flooding. This was the flood of record- during the storm, Squamish and Cheakamus River water levels rose to the highest levels ever recorded since gauges were installed in the early 1950's. This was likely a Q100 to Q130 event (a flood expected on average once every 100 to 130 years). At the subject property, water filled the overflow channel on the west side of the house, but did not come up to the level of the house, or surround the house with water, or cut-off access to the main Paradise Valley road and CN Rail line to the east. However, the flood did sever the main access road to the property.

8. On April 27, 2004, another assessment of flood hazards was completed on the property. This was done to support the construction of a second building on the northeast portion of Lot 3668 and confirmed the previously determined flood construction levels and other flood mitigation measures.

Conclusions

1. The subject property is on the eastern edge of the floodplain of the Cheakamus River, in a location where only a very unusual flood event would cause any inundation.

2. There is no evidence that the subject property is exposed to any other natural hazards, such as rock slides, debris flows, or other landslides.

3. The homes that have been built in the northeast corner of District Lot 3668 are in locations where current velocities during a flood are expected to be low, and therefore scour would not be a significant issue. The homes are also located in an open area where they would not impede the flow of water down the valley during a flood, and therefore, no channel ways to convey flood waters past the property are needed.

4. The homes in the northeast corner of District Lot 3668 are located in an area where it would be easy to evacuate inhabitants to higher ground during a flood. However, it is possible that normal access from this area to emergency services could be severed during a flood event. However, the area would not be completely isolated since it is very unlikely that the railroad track would be severed in both directions, and therefore it could be used to provide emergency access.

5. The homes in the northeast corner of District Lot 3668 are located in a low risk portion of the Cheakamus River floodplain and have been built to conform to required flood construction standards, and have been provided with extra protection to resist scour. They were not affected by the major flooding that occurred in October, 2003, which demonstrated that flood mitigation strategies for this area are adequate.

6. It is our conclusion that the existing homes in the northeast portion of District Lot 3668 are safe for the use intended, namely as a facility for accommodating up to about 50 residents.

7. As long as any additions to the existing homes, or new homes, conform with existing flood protection standards, they would also be safe for the use intended.

An Understanding:

The conclusions of this report are based on the currently available data and may need to be modified if additional information becomes available. It must be stressed that terrain analysis, hazard assessment and the evaluation of slope and hydrologic hazards is an inexact science and that any development in mountainous terrain is subject to some degree of geologic or hydrologic risk. This means that the absolute safety or stability of any proposed development cannot be guaranteed and that users of this report must accept a certain degree of risk if they carry out such development plans. If questions remain, additional specialist advice or a second opinion should be obtained.

Yours truly,

Frank W. Baumann

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