5690 Lakeshore Road NE
Salmon Arm, BC V1E 3P5
Phone/Fax: (250) 832-3095
Email: streamworks@telus.net

September 25, 2017

Ron Lindblad
c/o 1015 Lakeshore Drive SW
Salmon Arm, B.C.
V1E 1E4

Re: Capri Cabins – 1541 Blind Bay Road legally described as Lots 1 to 6, Plan EPS162, Section 15, Township 22, Range 11, W6M KDYD. Development Variance Permit No. 701-32

Dear Mr. Lindblad:

I have prepared this letter at your request as a follow-up to a flood risk assessment I provided to you dated May 14, 2007 for the above described property. It is my understanding that my original report was submitted to the Columbia Shuswap Regional District (CSRD) in July 2007 aimed at obtaining building permits for proposed improvements. Since that time, new units have been constructed, including new foundations and excavated basements. Setback distances and floor elevations for the newly constructed units differ from the existing buildings described in my original assessment. It is my understanding that CSRD has requested an update to the flood risk assessment. To this end, I have reviewed the updated survey information you provided (attached) and considered any changes to the flood risks associated with Shuswap Lake. No site visit was undertaken for this update/review. This letter summarizes my findings and recommendations.

As discussed in your correspondence with the Columbia Shuswap Regional District, South Shuswap Zoning By-law No. 701 requires a floodplain setback of 15m measured from the mean annual high water mark of Shuswap Lake. According to the current (August 2017) version of the By-law, the mean annual high water mark of Shuswap Lake is defined as 348.3 metres Geodetic Survey of Canada Datum. This elevation is plotted on the attached site survey plan on the lake side of the existing retaining wall. Setback distances to the three waterfront cabins are show on the plan, ranging from 10m to 14m to the front decks. Setback distances to the foundation walls would be approximately 2 to 3m further. These buildings are therefore not in compliance with the required setback and will require an exemption.

South Shuswap Zoning By-law No. 701 also specifies a minimum Flood Construction Level (FCL) of 351.0m Geodetic Survey of Canada Datum for land adjacent to Shuswap Lake. This is based on floodplain mapping and reports for the Salmon and Seymour Rivers issued in 1991 by the BC Ministry of Sustainable Resource Management. According to the reports, this elevation is administrative and includes 0.94m freeboard to allow for wave action and/or other sources of variability (Hay & Co. 1990, Crippen 1990).

As discussed in my original report, assigned freeboards used for limits of inundation range between 0.3 and 0.6m depending upon the length of record, confidence in the calculations and other factors. Higher freeboards are sometimes applied to river flood levels where there exists the possibility that debris and/or ice jams could locally elevate floodwaters. Shuswap Lake gauging dates back to 1923, providing a good data set for frequency analysis and debris or ice jams are unlikely to affect lake levels. With multiple medium-sized inflow tributaries (i.e. Shuswap River, Seymour River, Adams River and Eagle River) all draining divergent geographical regions, the likelihood of a single storm or runoff event affecting all tributary regions simultaneously is low. This functions to moderate flood peaks in the system and reduces variability. Shuswap Lake is a relatively large lake and its slow response to inflows from its tributary streams naturally attenuates flood peaks. The highest recorded level for Shuswap Lake was 349.66 in 1972 (1.34m below the calculated flood level). The added freeboard is also intended to accommodate wind and wave action.

Wind-related wave action on Shuswap Lake is relatively infrequent. Wave action at that time of year is usually the result of boat traffic and are likely to be less than 0.5m in height. In my opinion, the assignment of 351m as the flood level for Shuswap Lake based on 0.94m freeboard above a calculated 200 year level of 350.06, is conservative and provides more than adequate protection for development at or above this elevation.

The attached survey plan shows basement floor and main floor elevations for the newly constructed cabins. The basements are unfinished and are not used for living space, however they do house the furnace and hot water tanks for the units. It is my understanding that furnaces have been built on above-floor platforms of unspecified height. The following table summarizes the cabin floor elevations:

Table 1: Cabin Floor Elevations (elevations below the designated FCL are shown in italics)

Cabin #	Basement Elevation (m)	Main Floor Elevation (m)
1	351.86	354.28
2	***350.91***	353.30
3	***349.55***	352.00
4	***349.57***	351.94
5	***348.84***	351.28
6	***348.83***	351.18

Main floors in all of the cabins are above the 351m FCL. Basement floor elevations are below the FCL for all the cabins except Cabin #1. The tops of the foundation walls are likely close to the FCL. Assuming these walls are not overtopped by floodwaters, water can only enter the basements through seepage and/or backing up through the basement drains. It will be important to keep any water in the basement below the level of the elevated furnaces. To mitigate flood risks, automatic (float-switch) under-slab and outside perimeter sump pumps have been installed for each cabin. According to residents, sump pumps did not activate during high lake levels in 2012 or 2017, two relatively high water years (349.588m and 349.072m respectively). The 2017 lake level exceeded the basement floor levels in Cabins #5 and #6 with no reports of water/moisture problems. Installed sump pumps should be able to keep up with any basement seepage.

In my opinion, despite the floor elevations of the new structures and the variance in setback distance from the Bylaw requirements, the risk of damage from flooding on the property has not been significantly increased by the newly constructed cabins. Only in extremely rare circumstances (e.g. greater than 200 year water level combined with severe wave action) will the cabins be potentially at risk. The calculated 200 year flood level without freeboard (350.06m), falls below the top of the existing concrete retaining wall. This suggests that lake levels exceeding the top of the wall and flooding the lawn area will be extremely rare. The concrete retaining wall appears well-constructed and should serve to reduce erosion potential along the front of the properties. The existing wall does not appear to be retaining fill in order to support the cabins, that is, the cabins are built on native soils. The current structures remain well-back from the top of the retaining wall.

In summary, based on the surveyed information and the assumptions outlined, the improvements made to the Capri Cabins have not significantly increased the risk of flood damage on the property. The site remains suitably protected/elevated from flooding and/or foreshore erosion and may continue to be used safely. To mitigate potential damage for the new basements below the FCL, these areas should not be used as living space or for the storage of valuables. Sump pumps should be annually inspected and maintained to ensure functionality when lake levels rise in each May.

Please feel free to contact me if you have any questions regarding the contents of this letter.

Sincerely,

Alan Bates, P.Eng.
Water Resources Engineer
Streamworks Consulting Inc.

References:

Crippen Consultants 1990 *Salmon River – Shuswap Lake to Spa Creek - Floodplain Mapping Design Brief.* Province of British Columbia Ministry of Environment, Water Management Branch, Victoria, BC

Hay and Company March 1990 *Seymour River at Seymour Arm - Floodplain Mapping Design Brief*. Province of British Columbia Ministry of Environment, Water Management Branch, Victoria, BC

BROWNE JOHNSON LAND SURVEYORS

BRITISH COLUMBIA AND CANADA LANDS

Box 362, Salmon Arm, B.C. V1E 4N5 (250)832-9701

B.C. LAND SURVEYOR'S BUILDING LOCATION CERTIFICATE

To: Capri Cabin,
c/o Rick & Sandra Renard,
109 Branchflower Road,
Salmon Arm, B.C. V1E 3C6

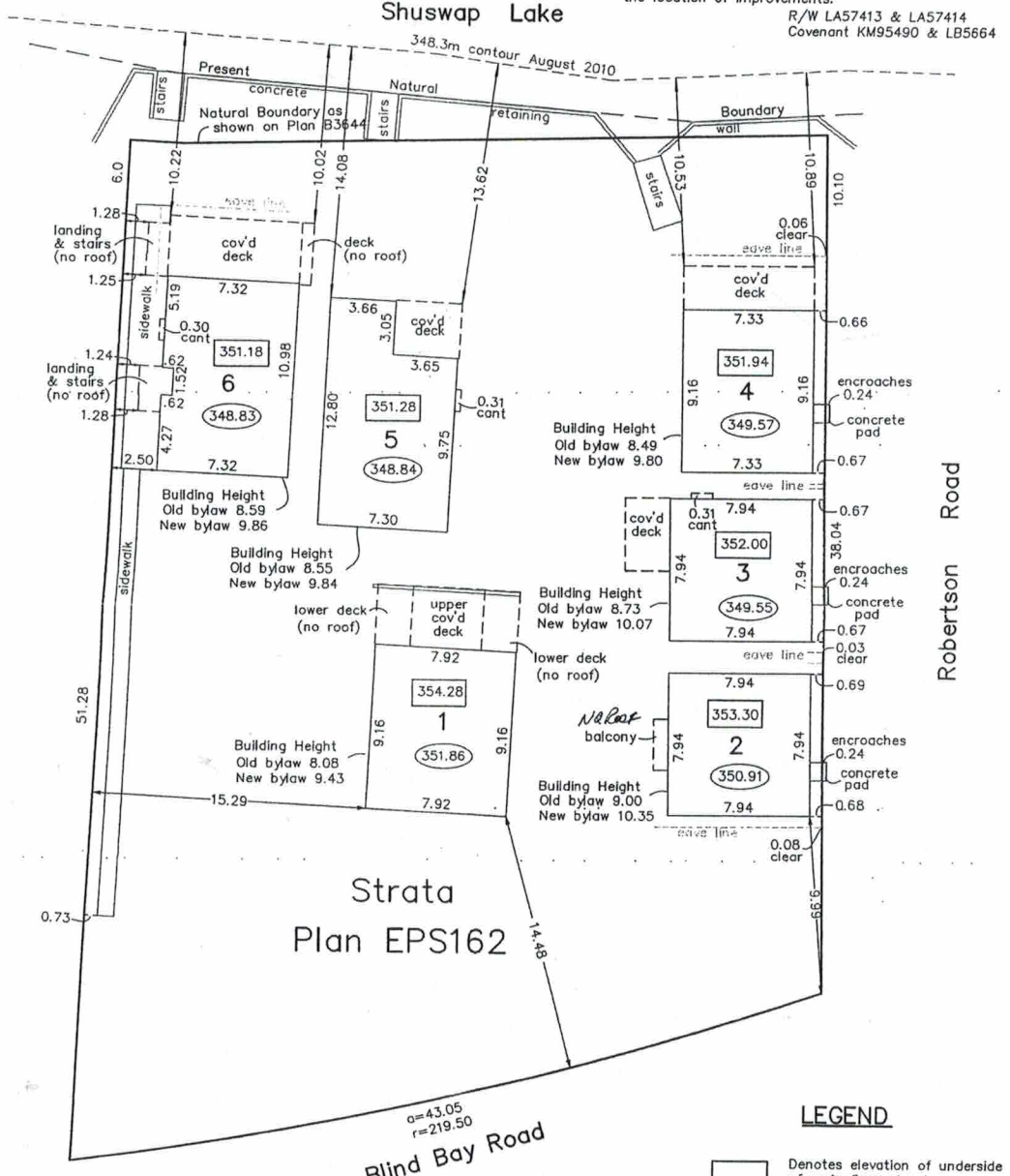
Your File:

Re: Strata Plan EPS162, Section 15, Township 22, Range 11, W6M, KDYD

Parcel Identifier(PID): 024-273-635

Civic Address: 1541 Blind Bay Road

List of documents registered on title which may affect the location of improvements:
R/W LA57413 & LA57414
Covenant KM95490 & LB5664



Scale 1: 250

5 0 5 10 15 20 25

All distances are in metres.

Dimensions derived from Plan KAP62863

Offsets from property line to building are measured from the siding.

LEGEND

Denotes elevation of underside of main floor structure

Denotes elevation of top of lower floor

The signatory accepts no responsibility or liability for any damages that may be suffered by a third party as a result of any decisions made, or actions taken based on this document.

This plan was prepared for inspection purposes and is for the exclusive use of our client. This document shows the relative location of the surveyed structures and features with respect to the boundaries of the parcel described above. This document shall not be used to define property lines or property corners.

This building location certificate has been prepared in accordance with the Manual of Standard Practice and is certified correct this 9th day of August ,2010.

B.C.L.S.

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Our File: 375-09 Fb: raw p.

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