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April 17, 2025

Cariboo Regional District

Suite D

180 North 3rd Ave

Williams Lake, BC V2G 2A4

Attention: Irene Israel (via email: iisrael@cariboard.ca)

Manager, Emergency Program Services

**Re: State of Local Emergency
702 and 718 Maple Drive
Quesnel, BC**

1 Introduction and Scope

As requested by the Cariboo Regional District (CRD), Westrek Geotechnical Services Ltd. (Westrek) was asked to provide an opinion on whether the slope conditions on and adjacent to 702 and 718 Maple Drive in Quesnel, BC have subsided such that the State of Local Emergency (SOLE) that these properties are currently under, could be removed.

The northeast side of both properties are located on the back scarp of the Red Bluff slide¹, although the houses are not, but are very close, i.e., within 5 m. This slide is a very large, slow moving landslide that is about 3 km wide and extends nearly 1 km downslope.

The services provided by Westrek are subject to the terms and conditions set out in the *Interpretation and Use of Study and Report and Limitations*, which is attached in Appendix A and incorporated herein by reference.

¹ The Red Bluff landslide is shown on Figure 7 in the *Quesnel Fringe OCP Terrain Hazard Study, Areas of Unstable Terrain* completed by AMEC; the date of this figure is January 28, 2009.

2 Background

Westrek was initially engaged by the CRD to review the stability of the slopes on and adjacent to these properties on May 8, 2020. This work was completed under the mandate of managing the imminent risk² to public safety, during emergency conditions.

In June and October of 2020, the CRD asked Westrek to review the conditions on these properties to determine if:

- The slope movement had stabilized, and
- The residents could return to their houses.

After both reviews, we could not conclude that the slope movement had stabilized and the imminent risk had subsided.

As our assessments for these reviews were done under emergency conditions, they did not include detailed subsurface investigations. Therefore, our recommendations could be subject to review following further investigation and analysis.

The following reports were prepared by Westrek following these reviews:

- *Emergency Landslide Assessment Red Bluff Slide Quesnel, BC* dated May 12, 2020.
- *Discussion of Evacuation Orders for Select Properties in the Cariboo Regional District, Quesnel, BC* dated June 25, 2020.
- *Review of Properties Under Evacuation Order in Quesnel Cariboo regional District, BC* dated October 30, 2020.

In October, 2024, BGC Engineering Inc. (BGC) conducted an investigation³ on behalf of RF Binnie & Associates Ltd. (Binnie), into the precipitation and stream flow patterns which may have contributed to the reactivation or acceleration of the ten (10) landslides in the Cariboo Road Recovery Projects (CRRP) for the BC Ministry of Transportation and Infrastructure. While the Red Bluff slide was not included in this investigation, several of the landslides in the CRRP are in close proximity to it.

From this investigation, BGC concluded the following:

- ***2020 experienced above normal amounts of precipitation, which resulted in significantly higher discharges at the nine watercourses examined and also higher than normal soil moistures.***
- ***The scaling factors for projected future IDFs for durations between 1- and 5-days show increasing intensity of larger return period events for longer-duration events. This trend will likely result in more frequent periods of landslide activity, particularly in the north end***

² BC legislation does not define *imminent hazard or risk*. For the purpose of this report, imminent hazard is defined as the existence of slope conditions likely to trigger a landslide prior to the opportunity to mitigate. Imminent risk is defined as a substantial likelihood of death or severe personal injury resulting from the imminent hazard.

³ *Cariboo Road Recovery Project Hydrometeorological Assessments and Review*, dated October 14, 2024.

of the study area (i.e., Quesnel) which appears to be more impacted by climate change than the southern end.

- *Projected soil moisture from PCIC-Gridded Hydrologic Model Output indicates clear upward trends in the maximum and mean soil moisture and downward trends in the minimum soil moisture. These changes may result in increased landslide activity towards the end of the century.*

Conversely, BGC did note that in other years where there was high landslide activity, there was not an increase precipitation, stream flow or soil moisture. No cause for this was offered.

3 Discussion

As noted in our earlier studies, the occurrence of and ongoing movement on large-scale landslides is usually associated with longer term changes in regional groundwater regimes; these changes are generally driven by climatic trends, and usually not related to individual weather events.

Also, the rate at which a large landslides moves is complex and can sometimes be differential, i.e., different parts of the slide can move at varying rates. Certain parts of a slide may activate and continue to move, while others can be seemingly stable (or inactive) for decades.

Whether the Red Bluff slide has ceased movement or is moving very slowly next to these properties is extremely difficult to determine without a detailed investigation, slope monitoring and analysis. Regardless, movement on these slopes could increase without warning, and if the movement is large enough, it could place the houses (and ultimately the residents if they were allowed to move back in) on these properties at an un-necessary risk.

In addition, it is highly unlikely there will be a cost effective way to stabilize the Red Bluff slide due to its size, and from an overall risk management perspective, locally stabilizing slopes adjacent to the houses on large landslide complexes is not recommended.

From BGC's (2024) conclusions on the projected effects of climate change on landslide activity in the Quesnel area, they suggest that there could be:

- *More frequent periods of landslide activity; and*
- *Increased landslide activity towards the end of the century.*

Therefore, while we cannot conclude definitively that the slope movement on and adjacent to these properties, which caused the SOLE to be first implemented, has abated significantly, we can state that:

- Future movement on the Red Bluff slide, if it is of a sufficient magnitude, could place the houses at an unnecessary risk.
- Climate change is likely to increase landslide activity on the Red Bluff slide; and
- There is no cost effective way to stabilize the Red Bluff slide.

As a result, we recommend against removing the SOLE that is currently in place on these properties.

4 Closure

We trust that this report is complete for your present requirements. Please contact the undersigned if you have any questions.

Yours truly,

Westrek Geotechnical Services Ltd.

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.

Timothy Smith PGeo PLEng
Principal and Senior Engineering Geologist

Permit #: 1002522

Attached: Appendix A, *Interpretation and Use of Study and Report and Limitations*

APPENDIX A

INTERPRETATION AND USE OF STUDY AND REPORT AND LIMITATIONS

1. STANDARD OF CARE.

This study and Report have been prepared in accordance with generally accepted engineering and geoscience practices. No other warranty, express or implied, is made. Geological and geotechnical studies and reports do not include environmental consulting unless specifically stated in the report.

2. COMPLETE REPORT.

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report which is of a summary nature and is not intended to stand alone without reference to the instructions given to us by the Client, communications between us and the Client, and to any other reports, writings, proposals or documents prepared by us for the Client relative to the specific site described herein, all of which constitute the Report.

**IN ORDER TO UNDERSTAND THE SUGGESTIONS,
RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN,
REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. WE
CANNOT BE RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF
THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.**

3. BASIS OF THE REPORT.

The Report has been prepared for the specific site, development, design objectives and purpose that were described to us by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document are only valid to the extent that there has been no material alteration to or variation from any of the said descriptions provided to us unless we are specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT.

The information and opinions expressed in the Report, or any document forming the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT OUR WRITTEN CONSENT. WE WILL CONSENT TO ANY REASONABLE REQUEST BY THE CLIENT TO APPROVE THE USE OF THIS REPORT BY OTHER PARTIES AS "APPROVED USERS". The contents of the Report remain our copyright property and we authorise only the Client and Approved Users to make copies of the Report only in such quantities as are reasonably necessary for the use of the Report by those parties. The Client and Approved Users may not give, lend, sell or otherwise make the Report or any portion thereof, available to any party without our written permission. Any uses, which a third party makes of the Report, or any portion of the Report, are the sole responsibility of such third parties. Westrek accepts no responsibility for damages suffered by any third party resulting from unauthorised use of the Report.

5. INTERPRETATION OF THE REPORT.

- (i) Nature and Exactness of Soil and Description: Classification and identification of soils, rocks, geological units, and engineering estimates have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature and even comprehensive sampling and testing programs, implemented with the appropriate equipment by experienced personnel, may fail to locate some conditions. All investigations utilising the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarising such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and all persons making use of such documents or records should be aware of, and accept, this risk. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- (ii) Reliance on Provided information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations or fraudulent acts of any persons providing representations, information and instructions.

- (iii) To avoid misunderstandings, Westrek should be retained to work with the other design professionals to explain relevant geotechnical findings and to review the adequacy of their plans and specifications relative to engineering issues. Further, Westrek should be retained to provide field reviews during the construction, consistent with generally accepted practices.

6. LIMITATIONS OF LIABILITY.

Westrek's liability will be limited as follows:

- (a) In recognition of the relative risks and benefits of the Services to be provided to the Client by Westrek, the risks have been allocated such that the Client agrees, to the fullest extent permitted by law, to limit the liability of Westrek, its officers, directors, partners, employees, shareholders, owners, subconsultants and principals for any and all claims, losses, costs, damages of any nature whatsoever or claims expenses from any cause or causes, whether arising in contract or tort including negligence, including legal fees and costs and disbursements (the "Claim"), so that the total aggregate liability of Westrek, its officers, directors, partners, employees, shareholders, owners, subconsultants and principals:
 - i. if the Claim is satisfied by the re-performance of the Services proven to be in error, shall not exceed and shall be limited to the cost to Westrek in re-performing such Services; or
 - ii. if the Claim cannot be satisfied by the re-performance of the Services and:
 - 1. if Westrek's professional liability insurance does not apply to the Claim, shall not exceed and shall be limited to Westrek's total fee for services rendered for this matter, whichever is the lesser amount. The Client will indemnify and hold harmless Westrek from third party Claims that exceed such amount; or
 - 2. if Westrek's professional liability insurance applies to the Claim, shall be limited to the coverage amount available under Westrek's professional liability insurance at the time of the Claim. The Client will indemnify and hold harmless Westrek from third party Claims that exceed such coverage amount. Westrek shall maintain professional liability insurance in the amount of \$2,000,000 per occurrence, \$2,000,000 in the aggregate, for a period of two (2) years from the date of substantial performance of the Services or earlier termination of this Agreement. If the Client wishes to increase the amount of such insurance coverage or duration of such policy or obtain other special or increased insurance coverage, Westrek will cooperate with the Client to obtain such coverage at the Client's expense.

It is intended that this limitation will apply to any and all liability or cause of action however alleged or arising, including negligence, unless otherwise prohibited by law. Notwithstanding the foregoing, it is expressly agreed that there shall be no claim whatsoever against Westrek, its officers, directors, partners, employees, shareholders, owners, subconsultants and principals for loss of income, profit or other consequential damages howsoever arising, including negligence, liability being limited to direct damages.

- (b) Westrek is not responsible for any errors, omissions, mistakes or inaccuracies contained in information provided by the Client, including but not limited to the location of underground or buried services, and with respect to such information, Westrek may rely on it without having to verify or test that information. Further, Westrek is not responsible for any errors or omissions committed by persons, consultants or specialists retained directly by the Client and with respect to any information, documents or opinions provided by such persons, consultants or specialists, Westrek may rely on such information, documents or opinions without having to verify or test the same.
- (c) Notwithstanding the provisions of the Limitation Act, R.S.B.C. 2012 c. 13, amendments thereto, or new legislation enacted in its place, Westrek's liability for any and all claims, including a Claim as defined herein, of the Client or any third party shall absolutely cease to exist after a period of two (2) years following the date of:
 - i. Substantial performance of the Services,
 - ii. Suspension or abandonment of the Services provided under this agreement, or
 - iii. Termination of Westrek's Services under the agreement,whichever shall occur first, and following such period, the Client shall have no claim, including a Claim as defined herein, whatsoever against Westrek.