

Campbell River Environmental Committee
2353 Dolly Varden Road
Campbell River, BC
V9W 4W5

(Via email)

Attention: **Leona Adams**

Re: **Shallow Aquifer – Request for Characterisation and Monitoring - Waste Discharge
Application Tracking Number 335965 and Authorization Number 107689 7295 Gold River
Highway, Campbell River, British Columbia**

GW Solutions Inc. (GW Solutions) is issuing this letter to express concern about the potential presence of a shallow aquifer at the location of Uplands site.

1 BACKGROUND

GW Solutions has reviewed several documents describing the hydrogeological conditions at and near the proposed Upland Landfill.

GW Solutions visited the site on December 11, 2018 and observed shallow groundwater. This was reported in GW Solutions report *“Review of GHD Technical Responses Task 7 and Task 8 - Upland Landfill – Waste Discharge Application Tracking Number 335965 and Authorization Number 107689 7295 Gold River Highway, Campbell River, British Columbia, January 2019”*, and in Dr. Gilles Wendling presentation to Campbell River’s mayor and council during the January 28, 2019 council meeting.

2 REQUEST

GW Solutions urges the Campbell River Environmental Committee (CREC) to request the regulatory agencies (in particular BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development – FLNRORD) to confirm or refute the presence of a shallow aquifer with a water table at or near the ground level at the base of the existing gravel pit.

This has to be done through the installation and monitoring of three shallow monitoring wells completed to a depth of 3 m, at the locations shown in Figure 1.



3 PREVIOUS REQUESTS

GW Solutions has made some requests, on behalf of CREC in past reports. To our knowledge, responses have not been provided. Therefore, we are reiterating these requests, in particular:

- The movement of water along the western boundary of the Upland site is complex and involves runoff, shallow groundwater movement, and deeper groundwater movement. This needs to be further investigated and monitored.
- The role played by the groundwater regime in the fractured bedrock aquifer still needs to be defined. This should particularly be taken into account in case of a catastrophic accidental event (e.g., resulting from a large earthquake) that would cause movement of landfilled waste and interruption of the drainage system (in addition to loss of integrity of the liner system). This scenario should be addressed (taking into account the time it would take to address and remediate the situation under such circumstances) and illustrated to confirm that the water quality of both Rico Lake and the receiving environment east of the landfill would not be affected.
- GW Solutions has not been able to review the HELP modeling results due to limited time and resources; however, GW Solutions hopes that FLNRORD has completed such a review. We note the version of the HELP model used dates back to 1997 (22 years old). We wonder whether a more recent modeling tool would provide more reliable results. GW Solutions and CREC would like to consult the review completed by FLNRORD.
- Should the Province decide to issue a permit allowing construction of the landfill, the following conditions should be requested:
 - a. Upland has to provide a plan to address the risk of contamination of the groundwater in case of a catastrophic scenario (e.g., a very strong earthquake). This plan should assume full built-up conditions, destruction of the drainage system, and tearing of the foundation liners. The plan has to describe both the assumptions used in the HELP model to describe this scenario and the long-term impacts on the groundwater quality within Upland property boundary and beyond.
 - i. The Province should provide proof that adequate securities are in place to address any control and mitigation measures that would have to be implemented. This should be provided to confirm that any long-term financial liabilities would not end-up being carried by the tax payers.
 - b. Upland should be prevented from modifying (i.e., blast or excavate) the bedrock under the footprint of the proposed landfill to reduce the risk of direct hydraulic contact with Rico Lake.
 - c. The maximum elevation of the landfill should be reduced to minimize the risk of any leachate originating from the landfill to reach a drinking water source, in particular following a catastrophic scenario. The maximum height could be selected based on the estimated groundwater regimes both in the fractured bedrock and the sand and gravel aquifer following a catastrophic scenario.

- d. The groundwater monitoring program should include locations along the western property boundary, in the bedrock and at the locations of the identified trough(s).
- e. The groundwater monitoring program should include locations along the eastern property boundary, in particular along the northeastern boundary. This should be done to properly define the groundwater regime and groundwater quality baseline, and to differentiate potential impacts originating from Upland property and impacts associated with the regional landfill.
- f. The monitoring program should include water and sediment sampling of Rico Lake, as a control measure to confirm that Upland's activities are not affecting the regional drinking water supply (see note below).
- g. Results of the monitoring program have to be reviewed on a yearly basis, and the information must be publicly available in a format easy to access and understand.
- h. Any control and mitigation measures relying on electric power (e.g., pumps) should be designed with a power back-up system, in light of anticipated power failures that are expected to become more frequent and possibly longer in the near future.

Note: CREC has expressed concerns about elevated concentrations of heavy metals in the sediments of Rico Lake. To date, CREC has not received any response from the BC Ministry of Environment and Climate Change Strategy nor FLNRORD.

4 STUDY LIMITATIONS

This document was prepared for the exclusive use of the Campbell River Environmental Committee. The inferences concerning the data, site and receiving environment conditions contained in this document are based on information obtained during investigations conducted at the site by GW Solutions and others and are based solely on the condition of the site at the time of the site studies. Soil, surface water and groundwater conditions may vary with location, depth, time, sampling methodology, analytical techniques and other factors.

In evaluating the subject study area and water quality data, GW Solutions has relied in good faith on information provided. The factual data, interpretations and recommendations pertain to a specific project as described in this document, based on the information obtained during the assessment by GW Solutions on the dates cited in the document, and are not applicable to any other project or site location. GW Solutions accepts no responsibility for any deficiency or inaccuracy contained in this document as a result of reliance on the aforementioned information.

The findings and conclusions documented in this document have been prepared for the specific application to this project, and have been developed in a manner consistent with that level of care normally exercised by hydrogeologists currently practicing under similar conditions in the jurisdiction.

GW Solutions makes no other warranty, expressed or implied and assumes no liability with respect to the use of the information contained in this document at the subject site, or any other site, for other than its intended purpose. Any use which a third party makes of this document, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. GW Solutions accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or action based on this document. All third parties relying on this document do so at their own risk. Electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore no party can rely upon the electronic media versions of GW Solutions' document or other work product. GW Solutions is not responsible for any unauthorized use or modifications of this document.

GW Solutions makes no other representation whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this document, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein.

If new information is discovered during future work, including excavations, sampling, soil boring, predictive geochemistry or other investigations, GW Solutions should be requested to re-evaluate the conclusions of this document and to provide amendments, as required, prior to any reliance upon the information presented herein. The validity of this document is

affected by any change of site conditions, purpose, development plans or significant delay from the date of this document in initiating or completing the project.

The produced graphs, images, and maps have been generated to visualize results and assist in presenting information in a spatial and temporal context. The conclusions and recommendations presented in this document are based on the review of information available at the time the work was completed, and within the time and budget limitations of the scope of work.

The Campbell River Environmental Committee may rely on the information contained in this memorandum subject to the above limitations.

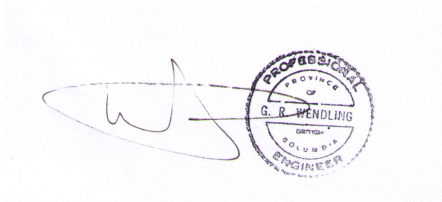
5 CLOSURE

Conclusions and recommendations presented herein are based on available information at the time of the study. The work has been carried out in accordance with generally accepted engineering practice. No other warranty is made, either expressed or implied. Engineering judgement has been applied in producing this letter-report.

This letter report was prepared by personnel with professional experience in the fields covered. Reference should be made to the General Conditions and Limitations attached in Appendix 1. GW Solutions was pleased to produce this document. If you have any questions, please contact me.

Yours truly,

GW Solutions Inc.



Gilles Wendling, Ph.D., P.Eng., President

Attachment: Appendix 1: GW SOLUTIONS INC. GENERAL CONDITIONS AND LIMITATIONS



APPENDIX 1

GW SOLUTIONS INC. GENERAL CONDITIONS AND LIMITATIONS

This report incorporates and is subject to these “General Conditions and Limitations”.

1.0 USE OF REPORT

This report pertains to a specific area, a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment. This report and the assessments and recommendations contained in it are intended for the sole use of GW SOLUTIONS's client. GW SOLUTIONS does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than GW SOLUTIONS's client unless otherwise authorized in writing by GW SOLUTIONS. Any unauthorized use of the report is at the sole risk of the user. This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of GW SOLUTIONS. Additional copies of the report, if required, may be obtained upon request.

2.0 LIMITATIONS OF REPORT

This report is based solely on the conditions which existed within the study area or on site at the time of GW SOLUTIONS's investigation. The client, and any other parties using this report with the express written consent of the client and GW SOLUTIONS, acknowledge that conditions affecting the environmental assessment of the site can vary with time and that the conclusions and recommendations set out in this report are time sensitive. The client, and any other party using this report with the express written consent of the client and GW SOLUTIONS, also acknowledge that the conclusions and recommendations set out in this report are based on limited observations and testing on the area or subject site and that conditions may vary across the site which, in turn, could affect the conclusions and recommendations made. The client acknowledges that GW SOLUTIONS is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the client.

2.1 INFORMATION PROVIDED TO GW SOLUTIONS BY OTHERS

During the performance of the work and the preparation of this report, GW SOLUTIONS may have relied on information provided by persons other than the client. While GW SOLUTIONS endeavours to verify the accuracy of such information when instructed to do so by the client, GW SOLUTIONS accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

3.0 LIMITATION OF LIABILITY

The client recognizes that property containing contaminants and hazardous wastes creates a high risk of claims brought by third parties arising out of the presence of those materials. In consideration of these risks, and in consideration of GW SOLUTIONS providing the services requested, the client agrees that GW SOLUTIONS's liability to the client, with respect to any issues relating to contaminants or other hazardous wastes located on the subject site shall be limited as follows:

(1) With respect to any claims brought against GW SOLUTIONS by the client arising out of the provision or failure to provide services hereunder shall be limited to the amount of fees paid by the client to GW SOLUTIONS under this Agreement, whether the action is based on breach of contract or tort;

(2) With respect to claims brought by third parties arising out of the presence of contaminants or hazardous wastes on the subject site, the client agrees to indemnify, defend and hold harmless GW SOLUTIONS from and against any and all claim or claims, action or actions, demands, damages, penalties, fines, losses, costs and expenses of every nature and kind whatsoever, including solicitor-client costs, arising or alleged to arise either in whole or part out of services provided by GW SOLUTIONS, whether the claim be brought against GW SOLUTIONS for breach of contract or tort.

4.0 JOB SITE SAFETY

GW SOLUTIONS is only responsible for the activities of its employees on the job site and is not responsible for the supervision of any other persons whatsoever. The presence of GW SOLUTIONS personnel on site shall not be construed in any way to relieve the client or any other persons on site from their responsibility for job site safety.

5.0 DISCLOSURE OF INFORMATION BY CLIENT

The client agrees to fully cooperate with GW SOLUTIONS with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The client acknowledges that in order for GW SOLUTIONS to properly provide the service, GW SOLUTIONS is relying upon the full disclosure and accuracy of any such information.

6.0 STANDARD OF CARE

Services performed by GW SOLUTIONS for this report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Engineering judgement has been applied in developing the conclusions and/or recommendations provided in this report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of this report.

7.0 EMERGENCY PROCEDURES

The client undertakes to inform GW SOLUTIONS of all hazardous conditions, or possible hazardous conditions which are known to it. The client recognizes that the activities of GW SOLUTIONS may uncover previously unknown hazardous materials or conditions and that such discovery may result in the necessity to undertake emergency procedures to protect GW SOLUTIONS employees, other persons and the environment. These procedures may involve additional costs outside of any budgets previously agreed upon. The client agrees to pay GW SOLUTIONS for any expenses incurred as a result of such discoveries and to compensate GW SOLUTIONS through payment of additional fees and expenses for time spent by GW SOLUTIONS to deal with the consequences of such discoveries.

8.0 NOTIFICATION OF AUTHORITIES

The client acknowledges that in certain instances the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by GW SOLUTIONS in its reasonably exercised discretion.

9.0 OWNERSHIP OF INSTRUMENTS OF SERVICE

The client acknowledges that all reports, plans, and data generated by GW SOLUTIONS during the performance of the work and other documents prepared by GW SOLUTIONS are considered its professional work product and shall remain the copyright property of GW SOLUTIONS.

10.0 ALTERNATE REPORT FORMAT

Where GW SOLUTIONS submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed GW SOLUTIONS's instruments of professional service), the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding. The hard copy versions submitted by GW SOLUTIONS shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancies, the hard copy versions shall govern over the electronic versions. Furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed version archived by GW SOLUTIONS shall be deemed to be the overall original for the Project. The Client agrees that both electronic file and hard copy versions of GW SOLUTIONS's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except GW SOLUTIONS. The Client warrants that GW SOLUTIONS's instruments of professional service will be used only and exactly as submitted by GW SOLUTIONS. The Client recognizes and agrees that electronic files submitted by GW SOLUTIONS have been prepared and submitted using specific software and hardware systems. GW SOLUTIONS makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.