GW SOLUTIONS
ASSESSMENT & PROTECTION OF GROUNDWATER

December 21, 2018
Project No.16-27

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

(Via email)

Attention: **Leona Adams**

Re: **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**

GW Solutions Inc. (GW Solutions) is pleased to present the following letter-report summarizing our review of the following documents:

- Technical Response to ENV Review (Auth. No.:Pr-10807) Task 8 – Sand and Gravel Aquifer Pumping Tests Upland Landfill Upland Excavating, Campbell River, British Columbia
- Technical Response to ENV Review (Auth. No.:Pr-10807) Task 7 – Additional Bedrock Characterization Upland Landfill Upland Excavating, Campbell River, British Columbia (original dated October 1, 2018, amendment dated December 11, 2018)
- Letter of March 23, 2018 prepared by GHD for Mr., Allan Leuschen, Ministry of Environment regarding *"Technical Response to ENV Review (Pr-Auth N0.: 10807), Upland Landfill, Upland Excavating, Campbell River, British Columbia,"* ("GHD Response Letter Tasks 1-6")

- Patrick Consulting Inc. Peer Review of Additional Information, Proposed Upland Landfill, Campbell River, BC, dated November 6.
- 88877-03(009)GN-WA005-FIGURE 2.2 (Figure 2.2 Cross-Section Plan)
- 088877-00(009)GN-SC001-FIGURE 2.10 (Figure 2.10 Cross-Section F-F')
- 088877-00(009)GN-SC001-FIGURE 2.11 (Figure 2.11 Cross-Section G-G')
- Campbell River Landfill Hydrogeological Assessment, EBA report to CH2M HILL for Regional District of Comox Strathcona, January 2004

1 REVIEW OF GHD SAND AND GRAVEL AQUIFER PUMPING TESTS DOCUMENT

GW Solutions provides comments when referring to sections of the document issued by GHD. Text from GHD is shown in *shaded italics.*

1.1 Section 3 Summary of Field Activities

During both tests, the pump was operated at the maximum flow rate of 24 L/min for the test duration.

GW Solutions considers the flow to be very low (6.3 USgpm) for such a permeable aquifer. The volume of water pumped during the pumping test is small and significantly limits the quality and breadth of the information gained during the pumping tests. It is not surprising that the effect of pumping was not observed at the monitoring wells selected for monitoring.

1.2 Section 4.1 Observations of Drawdown

100-min Pumping Test

Throughout the remainder of the test, the pressure transducer within MW4A-15 recorded a gradual increase in

drawdown. This gradual increase in drawdown recorded by the pressure transducer at MW4A-15 throughout the test is interpreted to be the result of drift in the transducer readings. The manual water level measurements recorded throughout the test verify this interpretation.

GW Solutions disagrees with this interpretation. It appears that GHD has made a mistake in the processing of the data from the datalogger.

8-hr Pumping Test

As observed during the 100-minute pumping test, the transducer installed at MW4A-15 exhibited drift in its pressure readings, and thus, the pressure transducer readings at MW4A-15 are unreliable.

GW Solutions has noticed that the data logger curve seems to mirror the manual data (Figure 1). Therefore, it is unlikely that such a curve could simply be interpreted by a drift of the data logger. GHD analysis should be reviewed and corrected, should GW Solutions assumption be correct.

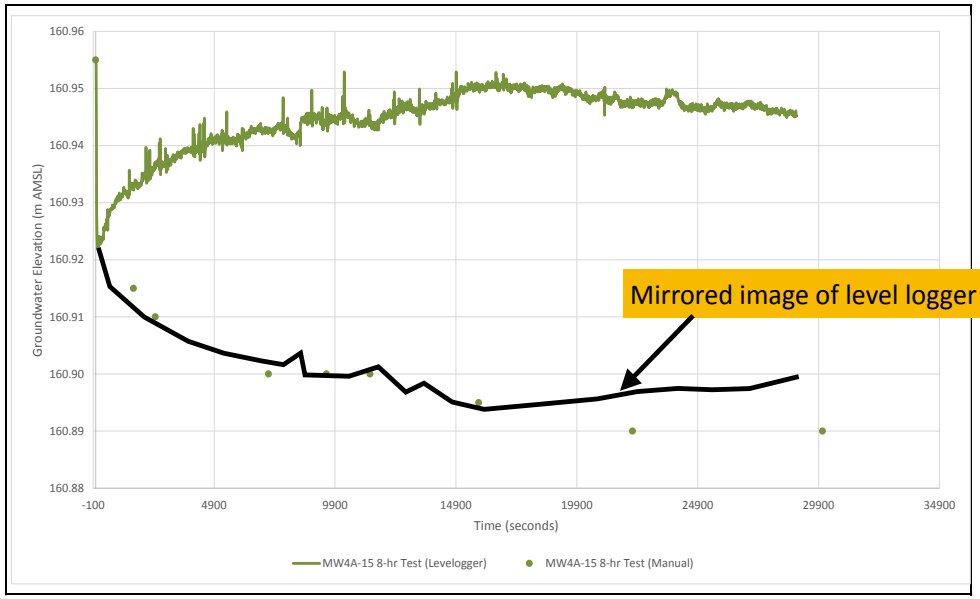

Figure 1: Data logger information - Potential misinterpretation (modified from GHD Figure 4.4)

It should be noted that the recovery data from MW4B-15 was not considered in this assessment. Groundwater recovery occurring at MW4B-15 was not representative of aquifer conditions as the pump discharge line drained back into the well following pump shutdown. This condition could not be avoided since the pump did not contain a check-valve.

This comment seems to indicates poor planning from GHD. Recovery data are very important in pumping test analysis. They allow to confirm the interpretation of data collected during the drawdown phase of the pumping test. A check valve could have been installed on the line, immediately above the pump.

Hydraulic Connection between the Sand and Gravel and Bedrock Aquifers

The drawdown observed in MW4A-15 in response to pumping at MW4B-15 during both the 100-min and 8-hour pumping tests confirms GHD's previous interpretation that the sand and gravel aquifer is hydraulically connected to the bedrock aquifer within the vicinity of pumping tests. There is a short time lag between drawdown observed within the pumping well (MW4B-15) and drawdown observed at MW4A-15 (as seen by comparing Figures 4.3 and 4.4). This time lag is a function of the vertical distance between the well screens and the permeability contrast that likely exists between the sand and gravel and bedrock aquifers.

This is a general comment. GHD should provide a proper analysis of the response to pumping of MW4A-15. This has not been done.

As described further below, a saturated thickness of 16 m was used to calculate hydraulic conductivity from the transmissivity values obtained through the analysis of the pumping test data. This thickness represents the total saturated thickness of the sand and gravel aquifer plus the upper 3 m of the bedrock aquifer.

GW Solutions disagrees with this assumption. The 3 upper meters of the bedrock aquifer should not be assumed to have the same hydrogeological characteristics and behaviour as the sand and gravel aquifer.

2 REVIEW OF GHD ADDITIONAL BEDROCK CHARACTERIZATION REPORT

2.1 Section 3 Summary of Field Activities

[...] as the depth to bedrock and geologic conditions was beyond the capabilities of conventional drilling equipment and methodologies used on-Site.

GW Solutions disagrees with GHD's statement. Drilling should be completed to confirm the topography of the bedrock and collect soil samples present in the conduit(s) between Rico Lake and the landfill.

2.2 Updated Site Geology and Hydrogeology Characterization

Updated Site Geology

- *Bedrock elevations between Rico Lake and the Pit were initially interpreted to range in elevations from 180 to 192 m AMSL. Based on new data collected, bedrock elevations between Rico Lake and the Pit are now observed to range between 170 to 193.46 m AMSL. A sand and gravel filled trough or scour channel in the bedrock surface appears to extend northeast from Rico Lake*.

GW Solutions globally agrees with this comment. This confirms a hydraulic connection between Rico Lake and the pit.

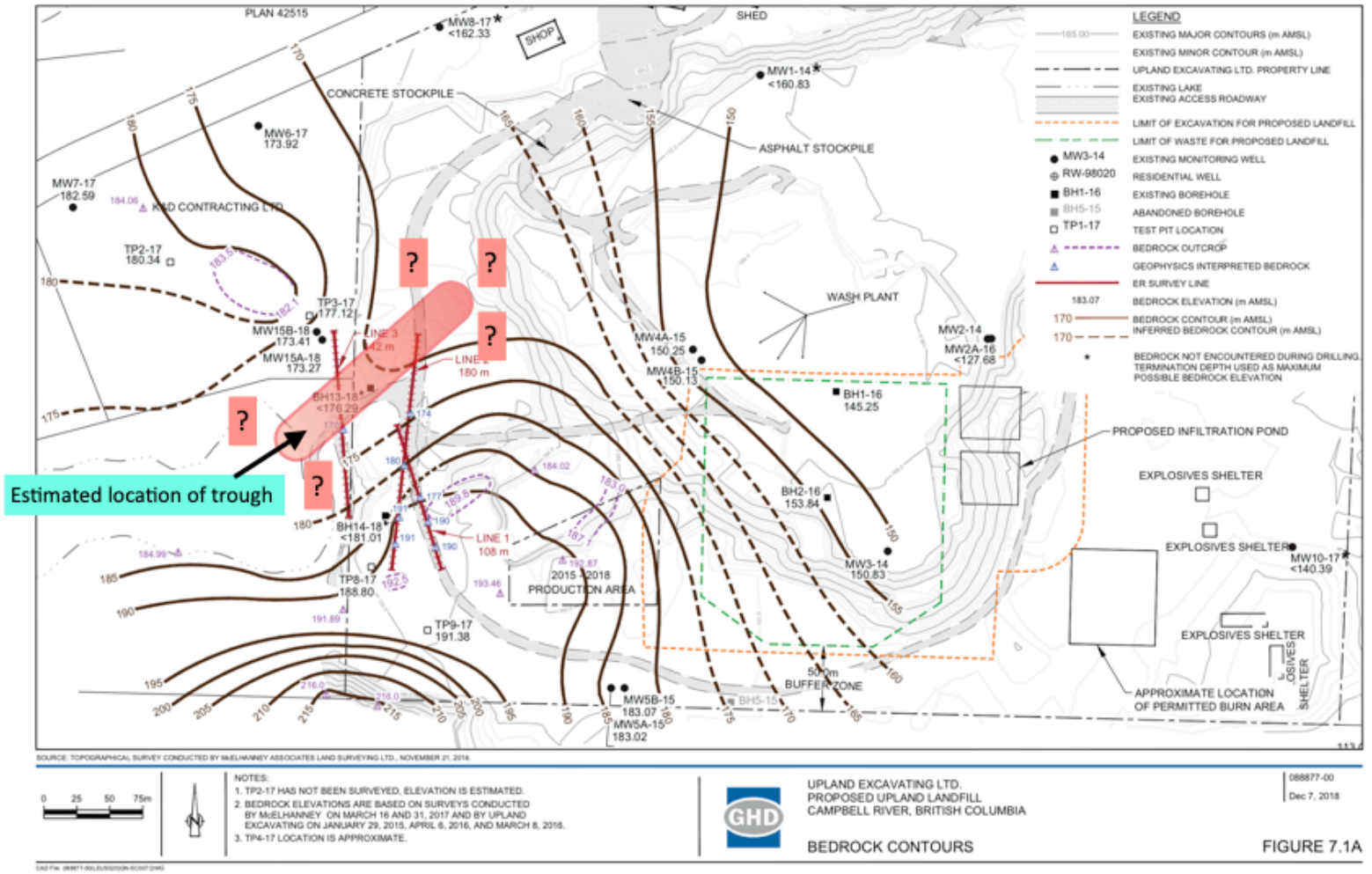

Figure 2: Bedrock topography and trough (estimated location) (Source: GHD Figure 7.1A modified)

Updated Site Hydrogeology

First, GW Solutions has noted that water levels monitored in MW 8-17 are very likely wrong (Table 5.1). The depth of the well is reported at 18.8 m and depth to water have constantly been measured at 19.7 m. These measurements very likely do not reflect the depth of the water table at this location.

- *On September 17, 2018, the water level within Rico Lake was surveyed at 178 m AMSL indicating horizontal flow in the sand and gravel towards the Pit below elevation 178 m AMSL is occurring. Water from Rico Lake also has the potential to flow through bedrock fractures and recharge the sand and gravel aquifer underlying the Site, based on the hydraulic conductivity of the bedrock measured at MW15A-18. Considering this, the location of the groundwater divide has been revised to be located along the eastern shore of Rico Lake (Figure 5.1).*

Photo 1: Rico Lake (looking west from Upland property)

GW Solutions understands that Rico Lake appears to discharge both westward toward McIvor Lake and eastward toward the Upland property.

Dr. Wendling visited the site on December 11, 2018 and noticed drainage discharging to Rico Lake from the Upland property (Photo 1). Therefore, 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 vertical hydraulic gradient between the sand and gravel overburden and the underlying shallow bedrock is upward in the western half of the Site. The hydraulic vertical gradient calculated for the new nested well showed a strong upward vertical gradient of 0.18 m/m. The hydraulic gradient calculated at MW4A-16 and MW4B-16 continues to show an upward gradient indicating that groundwater within the bedrock fractures discharges to the overlying sand and gravel unit across the western portion of the Site. Flow in the reverse direction, against the hydraulic gradients, cannot occur.*

GW Solutions considers that the groundwater regime in the bedrock has not been adequately defined. A Figure similar to the figure describing flow in the sand and gravel aquifer (e.g., Figure 3 – Groundwater Flow Model Plan View – GHD *Technical Response to ENV Review (Pr-Auth N0.: 10807), Upland Landfill)* is required to properly illustrate the groundwater regime in the bedrock aquifer. With that additional information, it will be possible to understand the groundwater flow in both aquifers and the connection between groundwater, the site, the lakes, and the receiving environment.

2.3 Conclusions

- *Evidence of a sand and gravel filled trough or scour channel within the bedrock appears to exist to the northeast of Rico Lake. The base of the trough is below the Rico Lake water level.*

The size and type of infill of these saddles/trough/crevices need to be characterized, as they will act as a conduit between Rico Lake and the landfill. This is critical new information which indicates a direct hydraulic connection between Rico Lake and the Upland Landfill.

An upward vertical gradient exists between the shallow bedrock and the overburden aquifers within the western portion of the Site.

This confirms that there is a different groundwater regime in the fractured bedrock aquifer and that groundwater flowing in the bedrock discharges to the sand and gravel aquifer. The groundwater regime in the bedrock aquifer is still very poorly understood and needs to be defined.

- *The predominant groundwater flow direction in the sand and gravel aquifer beneath the Pit is southeast from McIvor Lake across the Site.*

The absence of information about the elevation of the water table in the northeast quadrant of the site prevents defining whether groundwater flows more eastward.

Groundwater migrating from the eastern shore of Rico Lake flows east within the Quinsam River Watershed. The groundwater divide is further west then initially interpreted. The watershed divide is now interpreted to be located along the eastern shore of Rico Lake.

GW Solutions considers it is too premature to propose a location for a divide. In addition, 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.

3 REVIEW OF GHD FIGURES 2.10 AND 2.11

Figure 2.10 Cross Section F-F'

Elevation of Rico Lake appears to be too high. It should be 178 m.

Figure 2.11 Cross-Section G-G'

The location of both the limit of excavation and limit of waste footprints are misplaced.

4 REVIEW OF PATRICK CONSULTING INC. PEER REVIEW OF ADDITIONAL INFORMATION

On Page 7 of its report, PCI notes:

"Based on the occurrence and elevations of the top of bedrock, observations of outcrops, observations of bedrock retrieved from boreholes, and bedrock occurrence inferred from geophysics, it was concluded that the bedrock ridge identified previously was not continuous. Further, geologic and hydrogeologic information suggested the possibility of an infilled trough or crevice (located between boreholes BH13-18 and BH14-18, which had been drilled along the apparent ridge), that may permit a hydraulic connection between Rico Lake and the Site."

The presence of a hydraulic connection between Rico Lake and the Site is acknowledged.

In their interpretation of Site geology, GHD states that the bedrock between Rico Lake and the Site "significantly restricts the movement of groundwater between these two features", and makes reference to areas of competent versus fractured bedrock. Estimates of bedrock K were noted to be variable (i.e., MW15A-18, 8.3 x 10^{-3} cm/sec; MW14A-15, 2.2 x 10^{-2} cm/sec; and MW5A-15, 1.4 x 10^{-5} cm/sec). (p. 9)

In my view, GHD's assessment understates the relevance of the fractured bedrock in conveying groundwater from Rico Lake to the Sand and Gravel Aquifer beneath the Site.(p. 9)

GW Solutions agrees with PCI.

The hydraulic conductivity estimates for the bedrock, the recent groundwater elevation contour maps, and my observations all support the likelihood that the bedrock is a significant groundwater flow system at the Site. The frequency of fractures and groundwater contour maps indicate an interconnected fracture network, which in my view likely behaves as an equivalent porous medium at a volumetric scale of a few tens of cubic metres or less. (p. 10)

GW Solutions agrees with PCI; however, we believe there is not enough information to estimate the equivalent porous medium at a few tens of cubic meters. It could be much larger.

While there may be some zones of lower bulk hydraulic conductivity in the bedrock, there is nothing to suggest that these areas comprise a poorly connected system of isolated fractures, as speculated by GW Solutions Inc. (p. 10)

PCI has misinterpreted or misunderstood GW Solutions. GW Solutions did not speculate that there was a system of isolated fractures.

The presence of a perched zone or deeper water table at MW5A-15 has no influence on groundwater flow beneath the Site (refer to Figure 5.1 of GHD, reproduced above as Figure 1), or the potential to reverse the measured vertically upward hydraulic gradients from bedrock into the Sand and Gravel Aquifer.

PCI probably meant "higher" water table instead of "deeper" water table in the first sentence. GW Solutions understands that MW5A-15 may reflect a perched water table condition. Still, the water table in the bedrock aquifer is still very poorly characterized, in particular in the south-west corner of the property.

Hydraulic gradients in the bedrock convey the horizontal component of groundwater flow from areas of higher water elevation to the west, including Rico Lake, to lower elevations to the east and southeast, and vertically upward into the overlying Sand and Gravel Aquifer. This behaviour is consistent with observations and with expected hydraulic behaviour within a well-connected groundwater flow system through the fractured basalt. Consequently, groundwater from the Sand and Gravel Aquifer cannot enter the underlying bedrock,

GW Solutions agrees.

and groundwater from the Site, in either the Sand and Gravel Aquifer or in bedrock, cannot flow into Rico Lake.

GW Solutions agrees that groundwater will flow east in the sand and gravel aquifer. It will likely flow in a similar direction in the fractured bedrock across most of the site. However, the flow in the fractured bedrock is still unknown along the south

property line and along the ridge at the southwest corner of the property. In addition, a large portion of the landfill is proposed to be placed on bedrock.

Also, the observed upward vertical hydraulic gradient between the sand and gravel aquifer and the fractured bedrock aquifer **is not explained**. If both the aquifers were closely hydraulically connected and the main source of hydraulic head was Rico Lake, we should not observe such a vertical hydraulic gradient. If such a gradient is observed, the source of the hydraulic head is likely the fractured higher elevation bedrock at the south of the Uplands property.

This is important when considering a post closure catastrophic scenario that would be associated with an earthquake. In such a situation, it is likely that the south boundary of the landfill would be put in contact with the fractured bedrock. Therefore, the piezometric conditions in the bedrock would affect and likely increase the piezometric conditions within the damaged landfill and modify the groundwater regime.

In my view, the bedrock is sufficiently characterised and the groundwater flow system in the Sand and Gravel Aquifer sufficiently understood and the uncertainties sufficiently bounded to support the proposed landfill design presented by GHD.

GW Solutions disagrees with this statement, in particular where it refers to the definition of the groundwater flow system in the fractured bedrock.

GW Solutions would request that a piezometric contour map be produced describing a) the present conditions in the fractured bedrock and b) piezometric contours post closure following a catastrophic event associated with an earthquake and potential sloughing of the landfill, destruction of the drainage system, and rupture of the liners.

Other comment

PCI does not mention the numerous mistakes in the reports as noticed by GW Solutions.

5 COMMENT FOLLOWING DECEMBER 11, 2018 SITE VISIT

During his site visit on December 11, 2018, Dr. Wendling noticed that water was ponding on the gravel pit floor (Photo 2 and 3).

Photo 2: Gravel pit, looking north (Photo taken December 11, 2018)

Photo 3: Gravel pit, looking north (Photo taken December 11, 2018)

According to GHD, the elevation of the pit floor is approximately between 168 m and 169 m (Figure 3), and the elevation of the water table is expected approximately between 154 m and 162 m (Figure 3). Therefore, the water table should be at least 6 m below ground.

According to GHD, the sand and gravel is thick under the pit (Figure 4), and its hydraulic conductivity 2 x 10^{-2} cm/s (Technical Response to ENV Review (Auth. No.:Pr-10807) Task 8). **With such a high hydraulic conductivity, water should not be ponding, and surface water is expected to infiltrate very rapidly through the pit floor**.

In its *Campbell River Landfill Hydrogeological Assessment* (2004), EBA has produced a cross-section showing the presence of two aquifers in the sand and gravel deposits along Argonaut Road (Figure 5). These two aquifers, identified as Aquifer 1 and Aquifer 2 in Figure 5, are due to layers of sand deposits containing silt and acting as aquitards (shown in brown in Figure 5). **We note that Aquifer 1 is present at the right of the eastern boundary of Upland property**. Therefore, it is possible that the ponded water observed at the pit floor is daylighting groundwater from Aquifer 1, and that the presence of two aquifers in the sand and gravel deposit under the Upland property has been overlooked during GHD hydrogeological characterisation of the Upland property, in part due to the absence of monitoring wells in the northeast quadrant of the Upland property.

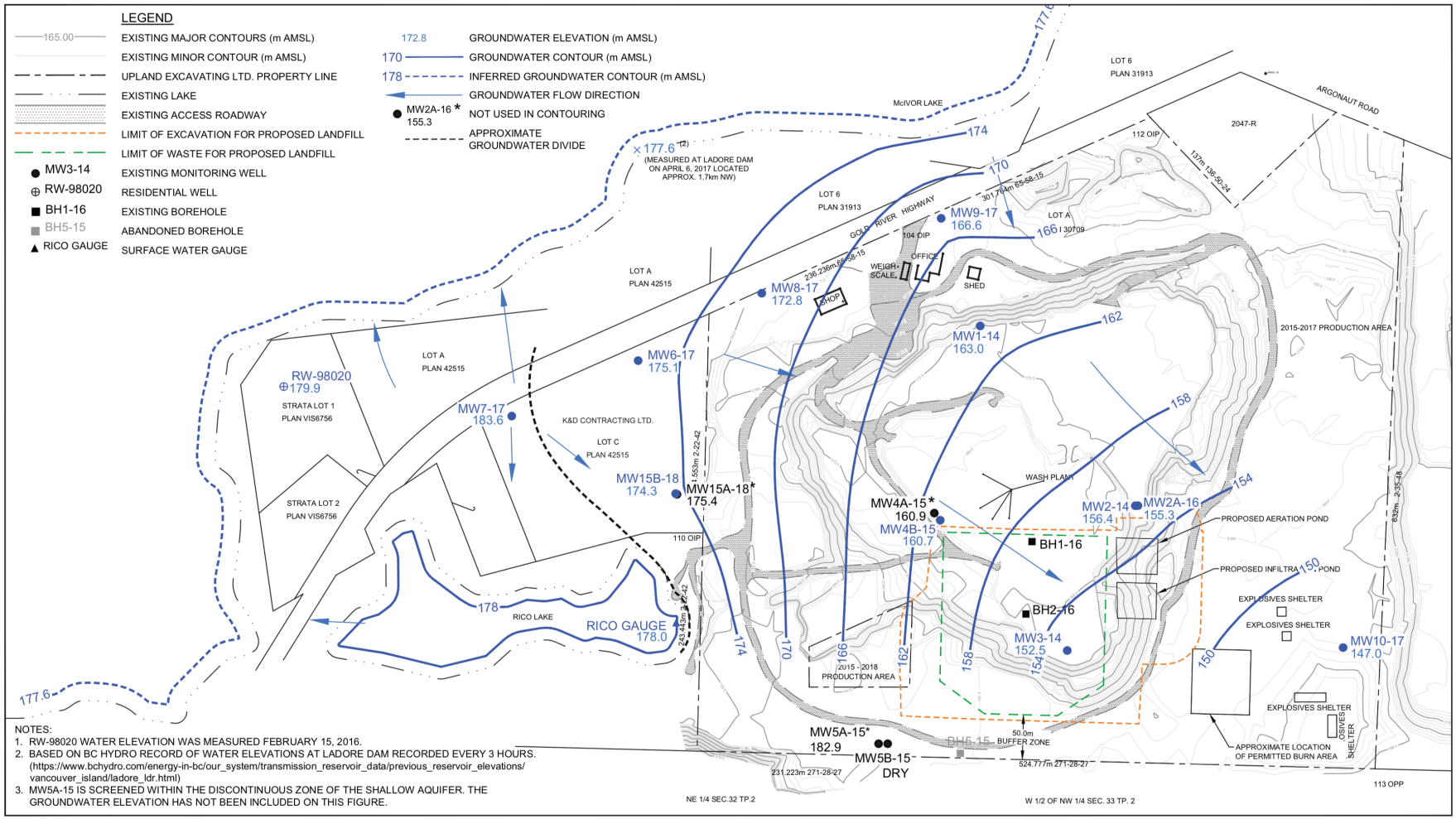

Figure 3: Water table in sand and gravel aquifer (Source: GHD Figure 5.1 – Oct 2018)

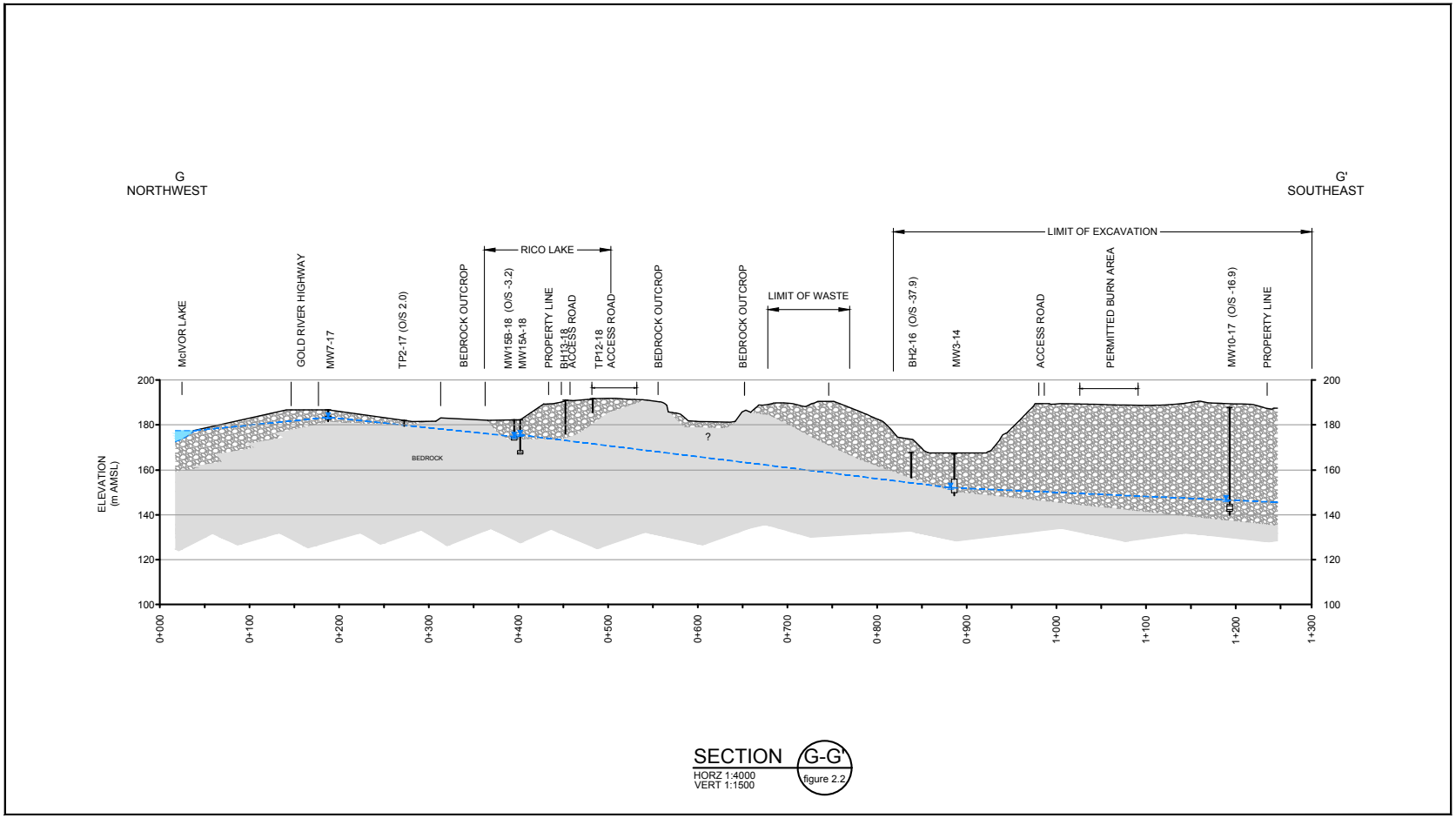

Figure 4: Cross-section through site (Source GHD Figure 2.11, October 30, 2018)

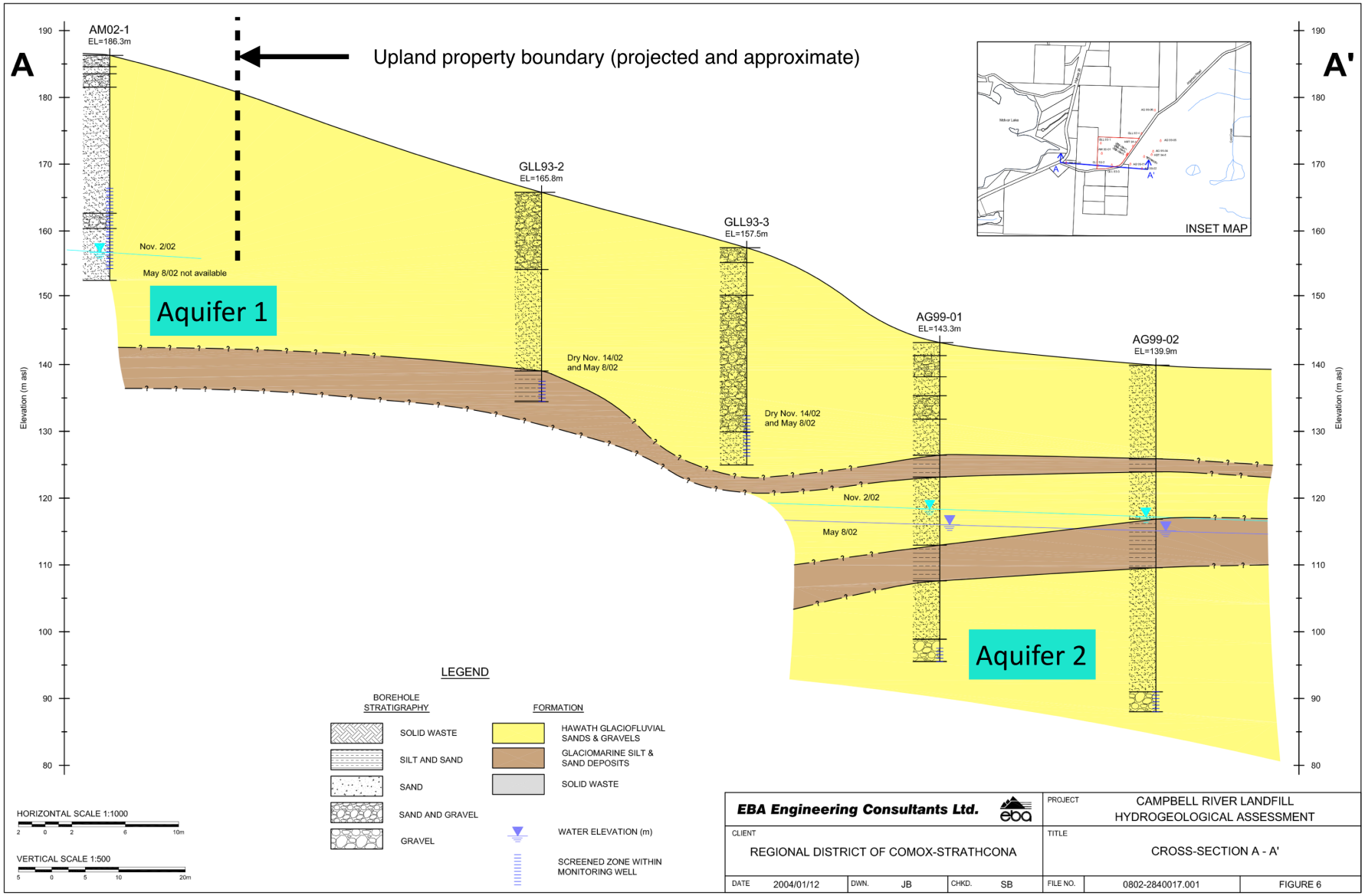

Figure 5: East-West cross-section showing two aquifers (Modified from EBA 2004, Figure 6)

If the presence of two aquifers is confirmed under Upland property, this should be considered to a) assess whether Upland is meeting existing mining regulations in regard to protection of aquifers and b) assess how the presence of a shallow aquifer modifies the waste discharge application under review.

6 KEY CONCERNS

GW Solutions expresses the following concerns:

- GW Solutions is concerned by the mistakes found in the reports. Although a revised version was provided for Task 7, it affects the credibility of the provided information.
- The key initial assumption that the landfill was separated from Rico Lake, which is part of the regional drinking water supply, by a bedrock ridge has now been refuted. The fact that there is likely a direct hydraulic connection between Rico Lake and the Landfill site drastically changes the perspective and foundation of the project.
- 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.
- Water has been observed ponding on the pit floor. This may be due to the presence of more than one aquifer in the sand and gravel deposit. If the presence of two aquifers is confirmed in the sand and gravel deposit under Upland property, this should be considered to a) assess whether Upland is meeting existing mining regulations in regard to protection of aquifers and b) assess how the presence of a shallow aquifer modifies the waste discharge application under review.
- 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.

7 RECOMMENDATIONS

Based on its understanding of the site and the proposed landfill, GW Solutions makes the following recommendations:

1. The Campbell River Environmental Committee (CREC) should request that Upland provides a proper definition of the groundwater regime in the fractured bedrock. This has to include drawings describing the groundwater direction in the fractured bedrock, in particular groundwater flow transiting through the Upland property to Rico Lake. Upland should describe present conditions, conditions post closure, and conditions post closure following a catastrophic scenario.

2. 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.

3. CREC should request that Upland provides a proper definition of the groundwater regime in the sand and gravel deposit, in particular whether two aquifers are present in this thick granular deposit.

4. CREC should request that the Province provides confirmation that the long-term risks of contamination have been properly modelled and that a full review of the HELP model submitted by Upland has been completed.

5. 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 (i.e., requested in recommendations 1, 2 and 3, above).

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.

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.

8 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.

9 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.