

Campbell River Environmental Committee (CREC)
PO Box 20092 STN. A, Campbell River, B.C. V9W 7Z5

April 24, 2019

Director
Minister of Environment and Climate Change Strategy
2080A Labieux Road, Nanaimo, BC
V9T 6J9

Re: CREC Comments on Operational Certificate #107689 at 7295 Gold River Highway, Campbell River

Dear Sir,

After reading all the reports commissioned to study this application for Upland Excavating Ltd. (Upland), the Campbell River Environmental Committee (CREC) feels the reports collectively raise the following issues:

1. Lack of sufficient data to support the application:

"In Waterline's opinion, insufficient baseline groundwater and surface water data has been collected by GHD to fully characterize the local and regional hydrogeological system in relation to the proposed landfill project." Source: Waterline Hydrogeological Review of the Proposed Upland Landfill, February 25, 2019, section 2.2 <https://crecwebcom.files.wordpress.com/2019/03/waterline-resources-inc.-report-feb-25-2019-2.pdf>

"Given the lack of long-term groundwater monitoring data, it is not possible to assess the following:

- The highest historical groundwater level that occurred on site over the monitoring period,
- How the groundwater elevations change (or don't change) in response to changes in the water level in Mclvor Lake which is controlled by BC Hydro at the Ladore Dam, and
- The hydraulic response in the sand and gravel and fractured bedrock beneath the Site to significant precipitation events or unusually wet periods." Source: Waterline Hydrogeological Review of the Proposed Upland Landfill, February 25, 2019 section 2.2

<https://crecwebcom.files.wordpress.com/2019/03/waterline-resources-inc.-report-feb-25-2019-2.pdf>

CREC Request for MOE:

Please provide confirmation that the long-term risks of contamination have been properly modelled and that a full review of the Hydrologic Evaluation of Landfill Performance (HELP) model submitted by Upland has been completed.

2. Drainage from Rico Lake to Mclvor Lake, our drinking water supply:

"Water flows from Rico Lake to Mclvor Lake." Source GHD Hydrogeology and Hydrology Characterization Report, May 31, 2017, Page 17

<https://crecwebcom.files.wordpress.com/2019/03/2017-05-31-ghd-hhcr.pdf>

CREC Video, April 8, 2016 <https://crecweb.com/>

3. Insufficient knowledge of the fractured bedrock hydraulic connection between Rico Lake and the pit:

“GHD appears to have repeatedly mischaracterised the hydraulic connection between the bedrock aquifer and the sand and gravel aquifer in the pit area.” Source: Waterline Hydrogeological Review of the Proposed Upland Landfill, February 25, 2019, section 2.3

<https://crecwebcom.files.wordpress.com/2019/03/waterline-resources-inc.-report-feb-25-2019-2.pdf>

“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.” Source: GW Solutions Review of GHD Technical Responses Task 7 and Task 8 - Upland Landfill- Key Concerns, p.19

<https://crecwebcom.files.wordpress.com/2019/03/2019jan02-uplands-review-gws-1-1.pdf>

“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.” Source: Patrick Consulting Inc November 6, 2018, Peer Review of Additional Information, Proposed Upland Landfill, Campbell River, BC. P.9

<https://crecwebcom.files.wordpress.com/2019/03/patrick-consult-inc-final-let-6nov2018-1.pdf>

CREC Request for MOE:

Please provide a proper definition of the groundwater regime in the fractured bedrock. This needs to include drawings describing the groundwater direction in the fractured bedrock, in particular groundwater flow transiting through the Upland property to Rico Lake. Present conditions, conditions post-closure, and conditions post-closure following a catastrophic scenario need to be described.

4. Groundwater flow between Rico Lake and the pit:

“Groundwater flow from Rico Lake towards the Pit occurs through the shallow sand and gravel aquifer and fractured bedrock. The groundwater contours shown on Figure 5.1 illustrates the hydraulic connection between Rico Lake and the Pit.” Source: GHD-Technical Response to ENV Review Task 7 – Additional Bedrock Characterization Upland Landfill, Conclusions, p.11

<https://crecwebcom.files.wordpress.com/2019/03/2018-10-01-ghd-addtl-bedrock-characterization-task-7.pdf>

“Based on the information reviewed, a hydraulic connection likely exists between the lakes and the aquifers beneath the proposed landfill, however insufficient data has been collected to fully understand this connection.”

Source: Waterline Hydrogeological Review of the Proposed Upland Landfill, February 25, 2019, section 2.1

<https://crecwebcom.files.wordpress.com/2019/03/waterline-resources-inc.-report-feb-25-2019-2.pdf>

“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.” Source: GW Solutions Review of GHD Technical Responses Task 7 and Task 8 - Upland Landfill, p.19

<https://crecwebcom.files.wordpress.com/2019/03/2019jan02-uplands-review-gws-1-1.pdf>

5. Water-ponding in the pit and groundwater levels beneath the pit:

“During Waterline’s January 22, 2019 site visit, significant ponding was noted in the base of the pit (Figure 7). The Upland staff indicated that the pond remains for most of the winter but the area is consistently dry in the summer (Terry Stuart and Mark Stuart pers. comm.). **The cause of ponding in the pit needs to be further investigated as it appears to contradict GHD’s interpretation of high infiltration capacity.** (emphasis added) The layered structure of the sand and gravel aquifer visible in the south pit wall, should have prompted in-situ testing to determine the site-specific infiltration capacity even for the preliminary landfill design.” Source: Waterline Hydrogeological Review of the Proposed Upland Landfill, February 25, 2019 section 2.4

<https://crecwebcom.files.wordpress.com/2019/03/waterline-resources-inc.-report-feb-25-2019-2.pdf>

“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.**”

Source: GW Solutions Review of GHD Technical Responses Task 7 and Task 8 - Upland Landfill, following December 11, 2018 Site Visit, P.15 <https://crecwebcom.files.wordpress.com/2019/03/2019jan02-uplands-review-gws-1-1.pdf>.

CREC Question for MOE:

Given Terry and Mark Stuart stated that the ponding remains for most of the winter, has MOE investigated this ponding?

Is the MOE satisfied that the groundwater level will not be less, during the winter, than the 1.5m below the bottom of the proposed landfill required in the Env. Landfill Criteria?

“For the gradients to reverse, causing groundwater to flow from the landfill area to the lakes, the hydraulic head in the landfill, infiltration ponds and/or pit area would have to be higher than the water levels in the lakes.” Source: Waterline Hydrogeological Review of the Proposed Upland Landfill, February 25, 2019 section 2.1

<https://crecwebcom.files.wordpress.com/2019/03/waterline-resources-inc.-report-feb-25-2019-2.pdf>

“The landfill design presented by GHD (2018a) is reproduced as Figure 3 for reference purposes. It shows the base of the landfill sloping from an elevation of 168 m AMSL on the south side to **a sump elevation of 164 m AMSL** at the center of the northern edge of the landfill. As referenced in GHD’s DOCP report, **the Landfill Criteria for Municipal Solid Waste (ENV 2016) requires that the landfill base be maintained at a minimum height of 1.5 m above the groundwater table at all times. Insufficient water level data has been collected to demonstrate that groundwater levels will remain 1.5 m below the base of landfill.** (emphasis added) In fact, groundwater levels at MW4A-15 was measured at 165.9 m AMSL on the 6 April 2017, and at 165.2 m AMSL in MW4B-1 5 on the 11 September 2015 **which are above the design elevation of the sump** (emphasis added) and likely do not meet the ENV landfill criteria. It should be specifically noted that no groundwater level measurements have been collected in the months of November or December which are generally the two wettest months of the year in the Campbell River area based on the historical precipitation record (Government of Canada 2018).”

“Source: Waterline Hydrogeological Review of the Proposed Upland Landfill, February 25, 2019 section 2.2

<https://crecwebcom.files.wordpress.com/2019/03/waterline-resources-inc.-report-feb-25-2019-2.pdf>

CREC question for MOE’s Response:

How can the Ministry legally approve a permit when advised by expert hydrogeologists that the base of the proposed landfill and the design elevation of the proposed sump will likely not meet the Env. Landfill criteria?

“The DOCP notes that water levels in the waste will be maintained at less than 0.3 m above the liner, therefore the maximum head in the landfill should be below 168.3 m AMSL. The design elevation of the top of the infiltration ponds is 170 m AMSL (Figure 3). Section 8.4.3 of the DOCP notes that in the case of a multi-day precipitation event temporarily overwhelming the infiltration areas, excess water will be directed to the pit floor. The pit floor elevation is 172 m AMSL, the pit floor covers an extensive area (Figure 2), **and therefore it is assumed that water elevations in the pit would likely not exceed 173 m AMSL.** (emphasis added) The closure plan presented in Section 8 and 11 of the DOCP, indicates that the long-term infiltration of runoff from the landfill will be to the base of the pit.” Source: Waterline Hydrogeological Review of the Proposed Upland Landfill, February 25, 2019 section 2.1 <https://crecwebcom.files.wordpress.com/2019/03/waterline-resources-inc.-report-feb-25-2019-2.pdf>

“Assuming:

- The proponent is able to address the infiltration and high groundwater table concerns noted in the following sections of this report and any associated design changes do not raise the water level in the landfill area above the minimum operational level of Mclvor Lake
- The landfill design and closure plan remains as described in the DOCP,
- BC Hydro does not change the management plan for the Ladore Dam,
- There is no catastrophic event that damages the dam and significantly lowers the water level in Mclvor Lake, and
- The closure plan for the whole site which has not been reviewed does not significantly change the hydraulics of the site.

It is unlikely that contamination from the proposed landfill, as currently designed, would reach Mclvor Lake.”

Source: Waterline Hydrogeological Review of the Proposed Upland Landfill, February 25, 2019 section 2.1 <https://crecwebcom.files.wordpress.com/2019/03/waterline-resources-inc.-report-feb-25-2019-2.pdf>

It is a known occurrence that the lowering of the Campbell Lake system is already in progress as outlined in BC Hydro’s e-mail dated, April 3, 2019. CREC believes it is **MORE LIKELY** that the lakes will lower due to climate change or increased BC Hydro power production.

https://crecwebcom.files.wordpress.com/2016/05/bc-hydro_-campbell-river-operations-update-dry-conditions.pdf

CREC Questions for MOE:

Will the MOE and BC Hydro take on the extra responsibility to absolutely guarantee that the level of Mclvor Lake will not be lowered to 170 or 173m AMSL in 5, 10 or 50 years?

Will the MOE absolutely guarantee there will be not be a catastrophic event (i.e. earthquake) or liner failure? Our drinking water depends on it?

“The bedrock groundwater level data do not appear to have been considered by GHD in relation to the ENV landfill criteria requirement of that groundwater levels be maintained **1.5 m** (emphasis added) below the base of the landfill.” Waterline Hydrogeological Review of the Proposed Upland Landfill, February 25, 2019, 2.3 <https://crecwebcom.files.wordpress.com/2019/03/waterline-resources-inc.-report-feb-25-2019-2.pdf>

6. Unexplained source of high levels of metals (aluminum, barium, calcium, iron, magnesium, sulphur, and zinc) currently found in Rico Lake sediment:

Leilane Barbosa Ronqui, PhD, found Aluminum, Barium, Calcium, Iron, Magnesium, Sulphur and Zinc all significantly greater in recent Rico Lake sediment sampling conducted by Upland (1 sample) than in adjacent control lakes. Source: Leilane Ronqui, Ph.D., Rico Lake – Sediment and Water Surface assessment, Nov. 1, 2018 https://crecwebcom.files.wordpress.com/2019/03/rico-lake-assessment_leilaner Ronqui-2.pdf

In February 2017, CREC sampled water flowing from Rico Lake to McIvor and found elevated Aluminum levels. Source: 2017/02/07 Maxxam Sampling Results

<https://crecwebcom.files.wordpress.com/2019/03/maxxam-sample-results-drainage-from-rico-to-mcivor-lake.pdf>

CREC Question for MOE:

Does the MOE plan to investigate these results prior to making a decision regarding this application and if not why not?

7. Drainage from the site east to Lost Lake, Cold Creek and the Quinsam River Hatchery unresolved:

CREC requests an explanation of why GHD did not use all available groundwater elevations in their modeling of groundwater flow, specifically data from southwest wells, as noted in the January 10, 2019 MOE, GW Solutions, the City of Campbell River and CREC meeting minutes.

<https://crecwebcom.files.wordpress.com/2019/04/final-january-10-2017-meeting-minutes.pdf>

Upland consultant, GHD, states there is a connection from the southwest wells to Upland's pit:

"MW5A-15 and MW5B-15 are located along the southeastern flank of the bedrock ridge approximately 23 m above the base of the Pit. Groundwater at this location is present within a thin overburden layer overlying competent bedrock. Based on the presence of a mountain to the south, **groundwater will likely flow downwards (potentially daylighting as seepage or through overburden materials as unsaturated flow) towards the Pit area** (emphasis added) where it will ultimately join the principal flow zone, flowing to the southeast." Source GHD Hydrogeology and Hydrology Characterization Report, May 31, 2017, Page 17 <https://crecwebcom.files.wordpress.com/2019/03/2017-05-31-ghd-hhcr.pdf>

"GWS modelled the hydraulic gradient using all available groundwater elevations. Our analysis does NOT match that of GHD." Source: GWS Uplands-review- 7/6/2016 presentation, slide 3

<https://crecwebcom.files.wordpress.com/2019/03/gws-presentation-of-upland-application-7-6-2016.pdf>

"GW Solutions has completed a preliminary conceptual model of the subsurface. It has used the data provided by GHD to map the piezometric conditions. GW Solutions interpretation of the data does not match GHD's interpretation. **GW Solutions estimates that groundwater moves in an east -northeast direction.**" (emphasis added) Source: GW Solution October 17, 2016 Review of Upland Excavating Landfill Application Technical Assessment Reporting, p. 2,

<https://crecwebcom.files.wordpress.com/2019/03/gws-review-of-upland-excavating-landfill-application-technical-assessment-reporting.pdf>

"In addition to the two features discussed, other surface water features are located hydraulically downgradient of the Site beyond 500 m that may receive groundwater passing beneath the Site. These features, which are not explicitly discussed as potential groundwater discharge areas, include ephemeral streams to the southeast, and possibly **Lost Lake to the east**, (emphasis added) which are illustrated on Figure 2.0A of the HHCR The relevance of these features is not clearly addressed in the impact assessment and, as discussed in my comments below, further clarification should be given with respect to compliance with CSR AW standards." Source: Patrick Consulting Inc., Peer Review of Technical Reports, Proposed Upland Landfill, Campbell River, BC, p.3

<https://crecwebcom.files.wordpress.com/2016/05/2017-10-05-ghd-to-moe-independent-peer-review-1.pdf>

"The observed flow to the east and southeast is consistent with the anticipated regional flow system in the Sand and Gravel Aquifer and in bedrock. Regional flow is to the east and southeast, with groundwater discharge into the Quinsam River watershed or beyond with discharge to the sea."

Source: Patrick Consulting Inc. November 6, 2018, Peer Review of Additional Information, Proposed Upland Landfill, Campbell River, BC, p.11 <https://crecwebcom.files.wordpress.com/2019/03/patrick-consult-inc-final-let-6nov2018-1.pdf>

8. No baseline groundwater sampling to the west, east and northeast of the proposed landfill location:

Monitoring wells are needed to the west and east of the proposed landfill site as shown in the GWS presentation.

Source: GWS presentation of Upland Application, Slide 8

<https://crecwebcom.files.wordpress.com/2019/03/gws-presentation-of-upland-application-7-6-2016.pdf>

“The groundwater monitoring program should include locations along the western property boundary, in the bedrock and at the locations of the identified trough(s).” Source: Review of GHD Technical Responses Task 7 and Task 8 - Upland Landfill, p. 21

<https://crecwebcom.files.wordpress.com/2019/03/2019jan02-uplands-review-gws-1-1.pdf>

“The groundwater monitoring program should include locations along the eastern property boundary, in particular along the northeastern boundary.” Source: Dec. 21, 2018 GW Solutions Review of GHD Technical Responses Task 7 and 8, p.21

<https://crecwebcom.files.wordpress.com/2019/03/2019jan02-uplands-review-gws-1-1.pdf>

“Proposed MW location may not actually be downgradient of infiltration pond.”

Source: GWS presentation of Upland Application, Slide 3

<https://crecwebcom.files.wordpress.com/2019/03/gws-presentation-of-upland-application-7-6-2016.pdf>

CREC Questions for MOE:

Why are there no water sampling wells between Rico Lake and the proposed landfill site to the west or east/northeast of the proposed landfill site?

Why are there no off-site sampling wells for baseline data to the east of Upland’s site?

The movement of water along the western boundary of the Upland site is complex and involves runoff, shallow groundwater movement, and deeper groundwater movement. Will the MOE require these runoff and groundwater movements to be studied?

9. Definition of the Campbell River Watershed Boundary unresolved:

“According to the BC Water Resource Atlas (2017) the Site is located on the watershed divide between the Campbell River and Quinsam River Watersheds.” Source: GHD 2017 Design, Operations, and Closure Plan. P.6

<https://crecwebcom.files.wordpress.com/2019/03/2017-05-31-ghd-hhcr.pdf>

“Based on the elevation differences between the lakes and the overburden sand and gravel flow zone, and the large difference in static water elevations between these two waters (sic) bearing zones, it is likely that **any hydraulic connection between the lakes and the overburden sand and gravel aquifer is a muted connection (weak connection)**” (emphasis added). Source: GHD Hydrogeology and Hydrology Characterization Report, May 27, 2016, p.13

<https://crecwebcom.files.wordpress.com/2019/03/2016-05-27-ghd-hhcr-part-1-of-2.pdf>

“**The hydraulic conductivity of the sand and gravel aquifer and measured hydraulic gradients between McIvor Lake and the Pit area are sufficiently high that drainage from the lake is very fast** (emphasis added).” McIvor Lake recharges the sand and gravel aquifer near the Site.” Source: GHD Hydrogeology and Hydrology Characterization Report, May 31, 2017, Page 14

<https://crecwebcom.files.wordpress.com/2019/03/2017-05-31-ghd-hhcr.pdf>

CREC Question for MOE:

Given the finding of very fast drainage between Mclvor Lake and the aquifer under Upland's pit, why does GHD still draw the watershed boundary between Mclvor Lake and Upland's site?

10. Proposed final elevation of landfill above Rico and Mclvor Lakes:

"The top final cover will have a crest elevation of 192 meters above Sea Level (AMSL), and a peak elevation of 195 m AMSL." Source: GHD 2017 Design, Operations, and Closure Plan. P.15

<https://crecwebcom.files.wordpress.com/2019/03/2017-05-31-ghd-docp.pdf>

Mclvor Lake surface is 177m above sea Level and Rico Lake surface is 178 to 181m AMSL. Source: Upland, City of Campbell River January 28, 2019 Council Meeting, delegation 4

http://archive.isiglobal.ca/vod/campbell/archive_2019-01-28.mp4.html

"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." Source: Dec. 21, 2018 GW Solutions Review of GHD Technical Responses Task 7 and 8 p.21

<https://crecwebcom.files.wordpress.com/2019/03/2019jan02-uplands-review-gws-1-1.pdf>

CREC Commentary:

At a November 29, 2018 meeting with MOE in Nanaimo, MOE suggested that CREC should talk to the Comox-Strathcona Waste Management board (CSWMB). However, the CSWMB, while agreeing that area landfills must update to the latest Landfill Criteria for Municipal Solid Waste as required in the Comox Strathcona Waste Management Plan, **did not support or oppose** Upland's application.

In April 2016 the CSWMB passed the following motion:

"THAT the Comox-Strathcona Waste Management Board advise Upland Excavating Limited **that we decline comment** (emphasis added) on their licence application for a waste discharge permit, AND THAT we encourage environmental assessments be undertaken by the Ministry of Environment and Fisheries and Oceans Canada to assure our local communities that the drinking water and fisheries values be protected and that any proposed landfill be designed to the most current BC Landfill criteria."

It appears that the Regional District has opted not to provide environmental comment and has left review and decision-making to the MOE in accordance with your mandate.

Expert hydrogeologists identify that assessments are still needed.

Professional Reliance model:

For the following reasons, CREC has lost confidence in the Professional Reliance model.

- We were told by Upland's consultant, GHD, that Rico Lake only drained east away from Mclvor Lake. CREC later proved that Rico Lake drained into Mclvor Lake, our drinking water. GHD then amended their report to reflect this.

- When identifying groundwater drainage from the proposed landfill site, GHD omitted groundwater elevations from the southwest wells. Other expert hydrogeologists identified groundwater flow to the east towards the DFO Quinsam River Hatchery. Neither MOE nor GHD have yet addressed this discrepancy.
- GHD has drawn the watershed divide contrary to the updated MOE Water Resources Atlas. In support of this, GHD stated that there is a weak connection between Mclvor Lake and the aquifer under Upland's site. Later, GHD revised that to a very fast groundwater drainage from Mclvor Lake to the aquifer. However, they have not amended the watershed divide in accord with the MOE Water Resources Atlas.

CREC also has concerns that the Ministry issued the notice of intent to approve Upland Excavating Ltd.'s Operational Certificate with many outstanding questions by a number of independent professional hydrogeologists. CREC believes that it was premature to issue the notice while these concerns remain unresolved.

Stated in an October 4, 2017 e-mail letter from MOE Laura Hunse to AC Anderson, "The recent inspection notes that compliance could not be determined in relation to the location of the landfill as it is an approximate hand-drawn sketch and thus unenforceable. If an OC is issued it will include updated requirements and replace the existing permit."

CREC Question for MOE:

Given that the MOE is not currently enforcing Upland's existing permit regarding where waste is deposited, what confidence can we have that the MOE can/will enforce the conditions of the new operational certificate?

Despite Upland claiming their proposal will use one of the most advanced engineered designs to date using a lined cell system to contain and treat the waste leachate, this remains unproven technology as Environment Canada states: "It is now accepted that all landfills will eventually release leachate to the surrounding environment and therefore all landfills will have some impact on the water quality of the local ecosystem." *Source: Environment Canada (2001) Threats to Sources of Drinking Water and Aquatic Ecosystem Health in Canada - Landfills and Waste Disposal ("Threats to Drinking Water") at p.51.*

CREC remains very concerned with the identified risks of a potential catastrophic (i.e. earthquake) or simple failure. We are all told to become increasingly prepared for the "big one" and if it were to happen, this event has the potential to see structural failures in the lined cell. When asked by CREC at a November 29, 2018 meeting, MOE suggested a post-contamination corrective action would be to pump out the Class IIA aquifer. But pump it to where? The Campbell River Environmental Committee fails to see this as a viable and reasonable "backup" plan. The Province is spending millions to seismically upgrade the BC Hydro Dams. CREC requests that the MOE show the same concern for our drinking water.

Access to safe drinking water is a basic necessity of life. The government of British Columbia and the employees in the Environmental Protection Division of MOE should not permit contaminated soils to be stored so close to Campbell River's only source of drinking water - our water is too precious. Our government has a social responsibility to protect the public from exposure to harm when scientific investigation has found a potential risk. In light of the existing uncertainties raised by expert reports, CREC opposes this application.

We look forward to receiving your response to our fourteen questions/requests contained in this letter in a timely manner as the clock is ticking on this application.

Sincerely,

The Campbell River Environmental Committee,
Per.

Leona Adams
President, CREC

Attachments: 1. Proximity of drinking water to the proposed landfill
2. Ponding in Upland's Pit
3. Height of proposed landfill
4. Aquifer showing principal groundwater flow offsite

cc: Upland Excavating Ltd
Premier John Horgan
Luc Lachance, MOE
Allan Leuschen, MOE
Minister George Heyman, MOE
Minister Michelle Mungall, MEM
David Caughill, MEM
Dale Desrochers, DFO
Minister Claire Trevena, MOTI
Sonia Furstenau, MLA
Terri Martin, City of Campbell River
Matt Rykers, City of Campbell River
Elle Brovold, City of Campbell River for Mayor and Council



McIvor Lake
Drinking Water

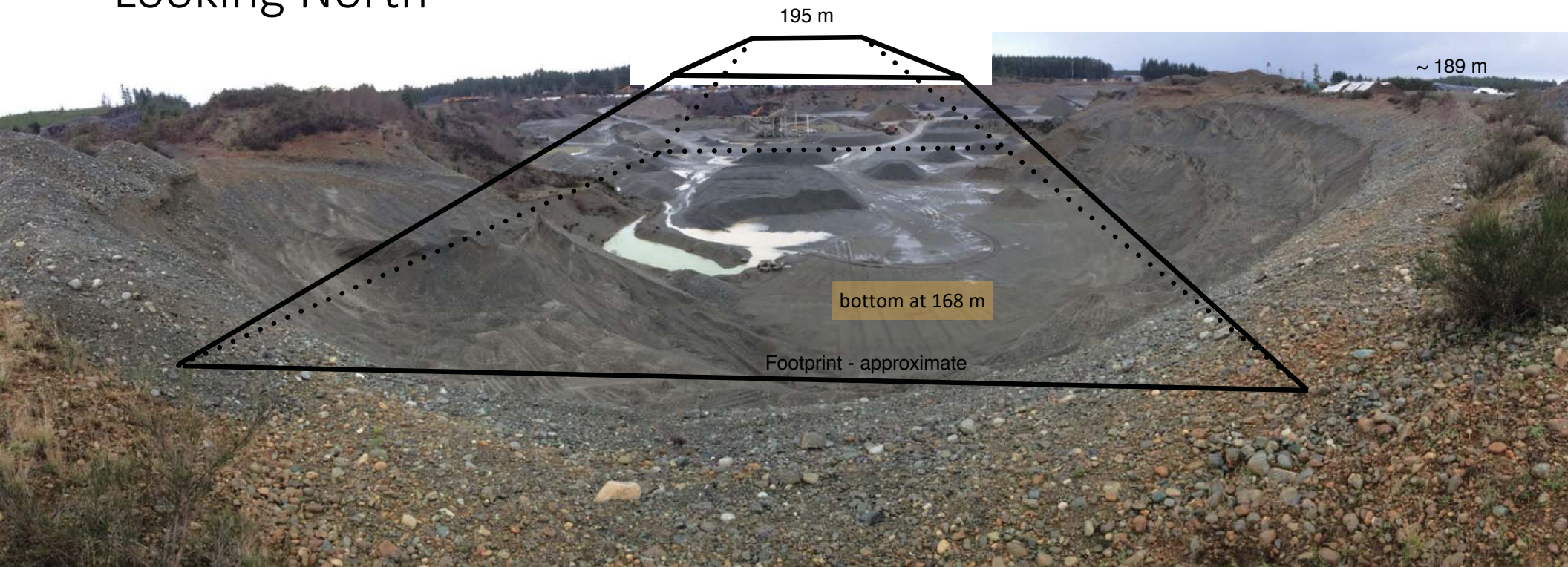
**Upland Excavating
Proposed Landfill**

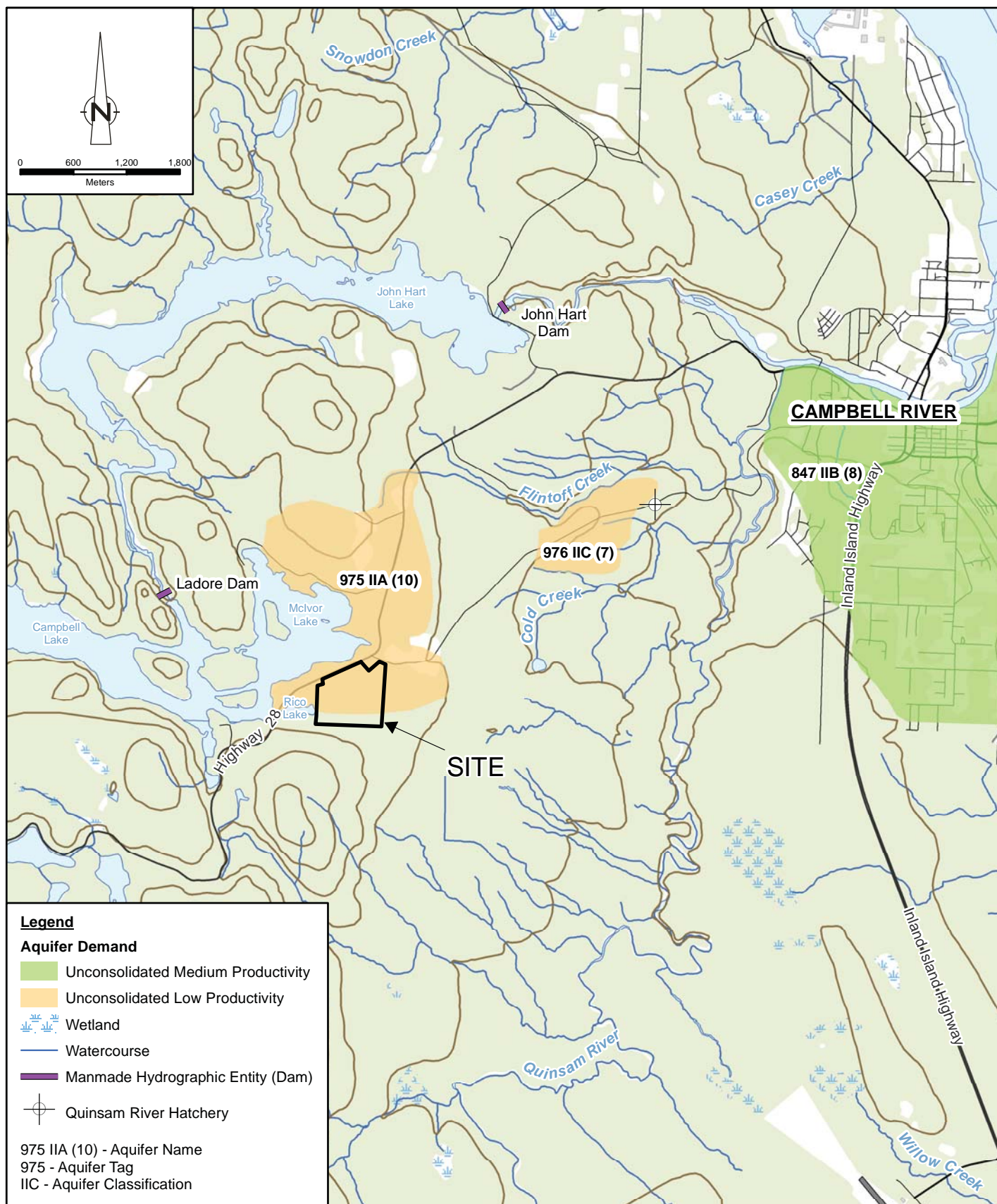
Rico Lake



Figure 7: View of pit from the south, ponding in foreground at the location of proposed landfill

Looking North





Source: CanVec Edition 1.1 © Department of Natural Resources Canada. All rights reserved. National Road Network 2.0 GeoBase
Coordinate System: NAD 1983 UTM Zone 10N



UPLANDS EXCAVATING LTD.
PROPOSED UPLAND LANDFILL
HYDROGEOLOGIC AND HYDROLOGY CHARACTERIZATION REPORT

088877-03
May 23, 2017

DRAINAGE MAP

FIGURE 2.1