

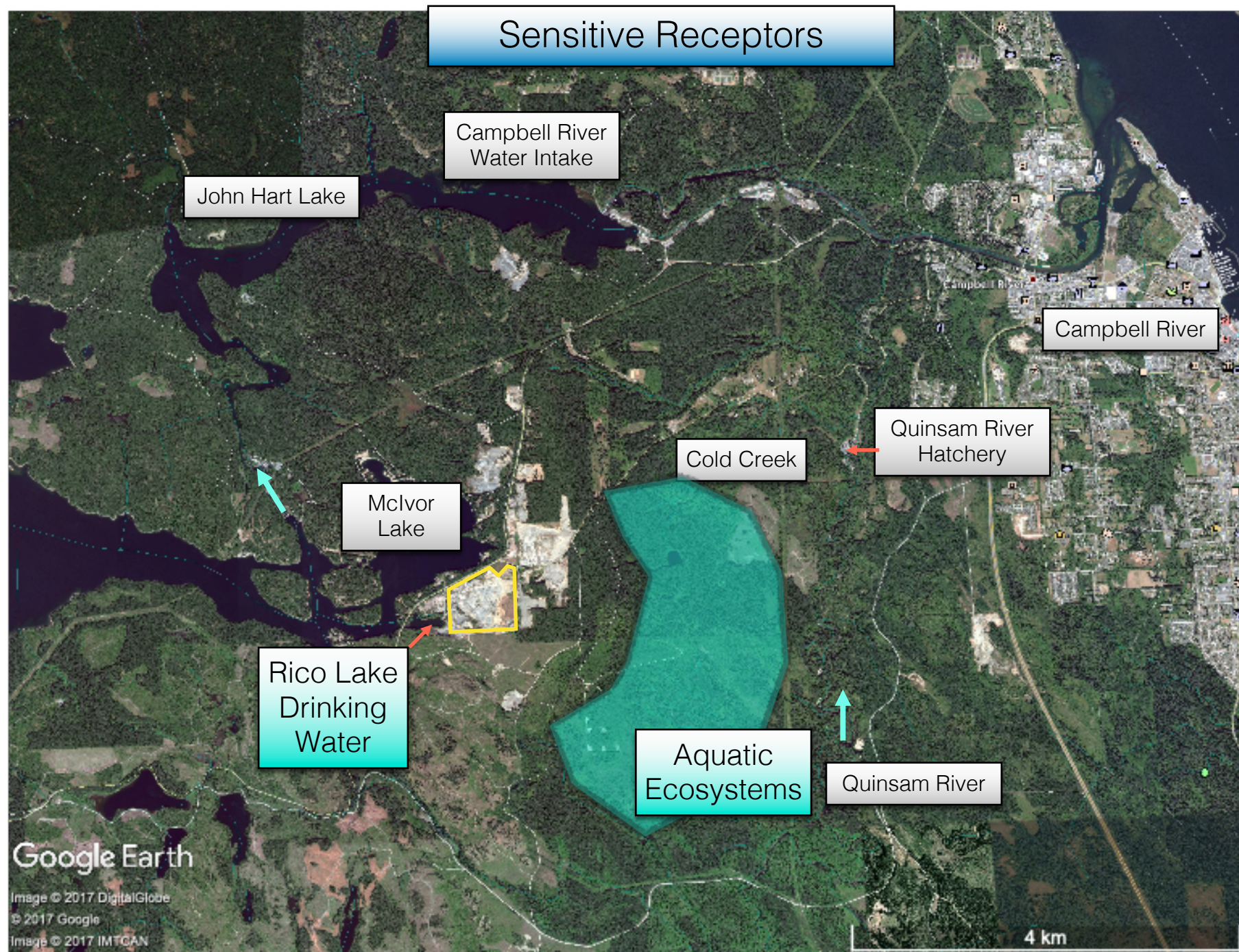
PROPOSED UPLAND LANDFILL

HYDROGEOLOGICAL REVIEW

BY: DR. GILLES WENDLING, P.ENG.
GW SOLUTIONS

FOR:
CAMPBELL RIVER ENVIRONMENTAL
COMMITTEE (CREC)

Campbell River, January 28, 2019



KEY ISSUES

- **Groundwater Flow in Bedrock**
- Risk of Impact to Rico Lake - Part of Drinking Water Source
- High Water Table in Existing Pit

--- LIMIT OF EXCAVATION FOR PROPOSED LANDFILL

--- LIMIT OF WASTE FOR PROPOSED LANDFILL

Proposed Landfill

Mclvor Lake

LOT A
PLAN 42515

LOT A
PLAN 42515

STRATA LOT 1
PLAN VIS6756

STRATA LOT 2
PLAN VIS6756

LOT C
PLAN 42515

CONCRETE STOCKPILE

ASPHALT STOCKPILE

WASH PLANT

Rico Lake

approx: 270 m

2015 - 2018
PRODUCTION AREA

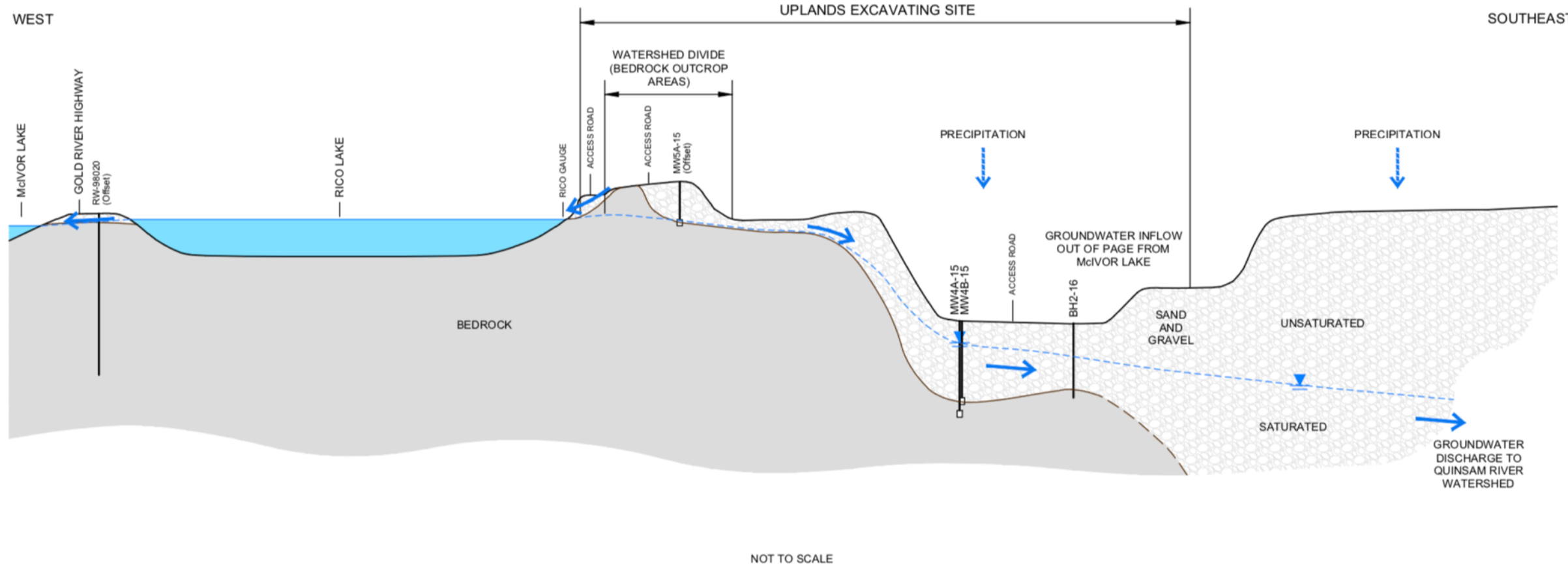
50.0m
BUFFER ZONE

LIMIT OF

WEST

UPLANDS EXCAVATING SITE

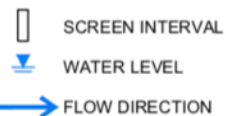
SOUTHEAST



NOTES:

1. ONSITE TOPOGRAPHY IS BASED ON THE TOPOGRAPHICAL SURVEY CONDUCTED BY McELHANNEY ASSOCIATE LAND SURVEYING LTD., NOVEMBER 21, 2016.
2. OFFSITE TOPOGRAPHY HAS BEEN ESTIMATED USING ESRI TOPOGRAPHIC BASEMAP, ACCESSED 2017; BRITISH COLUMBIA MINISTRY OF ENVIRONMENT, WATER PROTECTION AND SUSTAINABILITY BRANCH, SEPTEMBER 11, 2014.
3. RICO LAKE IS APPROXIMATELY 12 M DEEP (LAKE BOTTOM IS AT 168 mAMSL) - MEASURED BY CAMPBELL RIVER ENVIRONMENTAL COMMITTEE.
4. ALL LOCATIONS ARE APPROXIMATE AND MEANT TO DEMONSTRATE CONCEPTUAL FLOW DIRECTION.

LEGEND



UPLAND EXCAVATING LTD.
 PROPOSED UPLAND LANDFILL
 HYDROGEOLOGIC AND HYDROLOGY CHARACTERIZATION REPORT
 CONCEPTUAL FLOW MODEL -
 SCHEMATIC CROSS-SECTION - WEST-SOUTHEAST

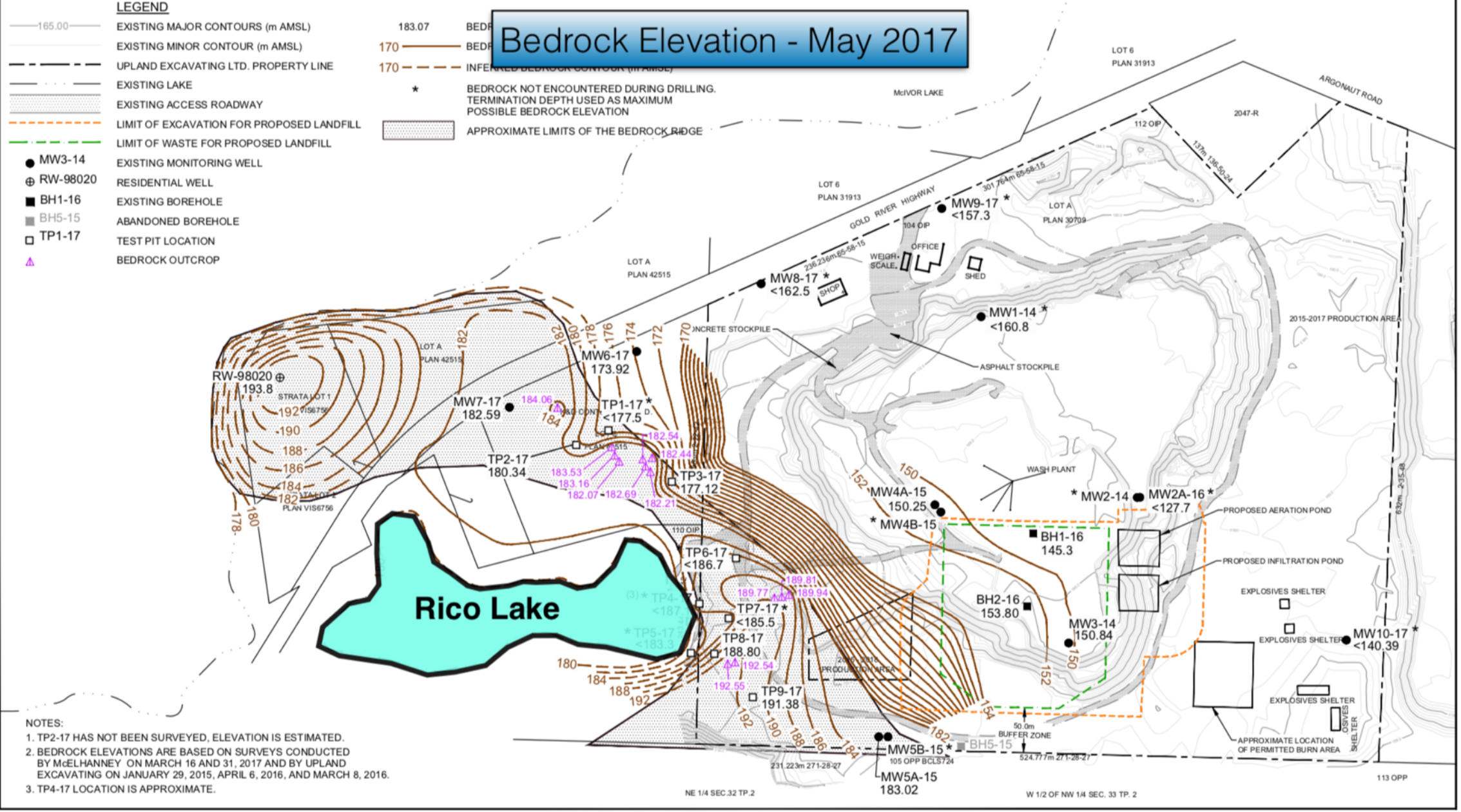
88877-03

May 23, 2017

5

FIGURE 3.0C

Bedrock Elevation - May 2017

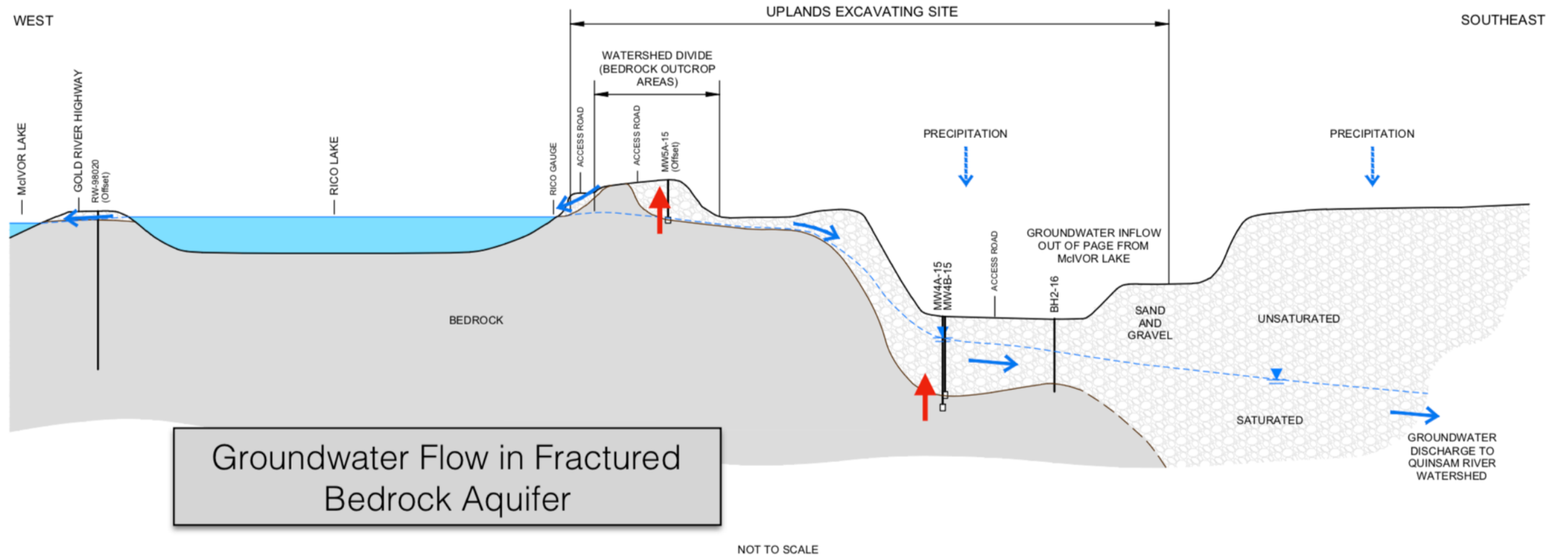


Bedrock Hill

Rico Lake



Looking West



- NOTES:
1. ONSITE TOPOGRAPHY IS BASED ON THE TOPOGRAPHICAL SURVEY CONDUCTED BY McELHANNEY ASSOCIATE LAND SURVEYING LTD., NOVEMBER 21, 2016.
 2. OFFSITE TOPOGRAPHY HAS BEEN ESTIMATED USING ESRI TOPOGRAPHIC BASEMAP, ACCESSED 2017; BRITISH COLUMBIA MINISTRY OF ENVIRONMENT, WATER PROTECTION AND SUSTAINABILITY BRANCH, SEPTEMBER 11, 2014.
 3. RICO LAKE IS APPROXIMATELY 12 M DEEP (LAKE BOTTOM IS AT 168 mAMSL) - MEASURED BY CAMPBELL RIVER ENVIRONMENTAL COMMITTEE.
 4. ALL LOCATIONS ARE APPROXIMATE AND MEANT TO DEMONSTRATE CONCEPTUAL FLOW DIRECTION.

(Modified from GHD Figure 3.0C)

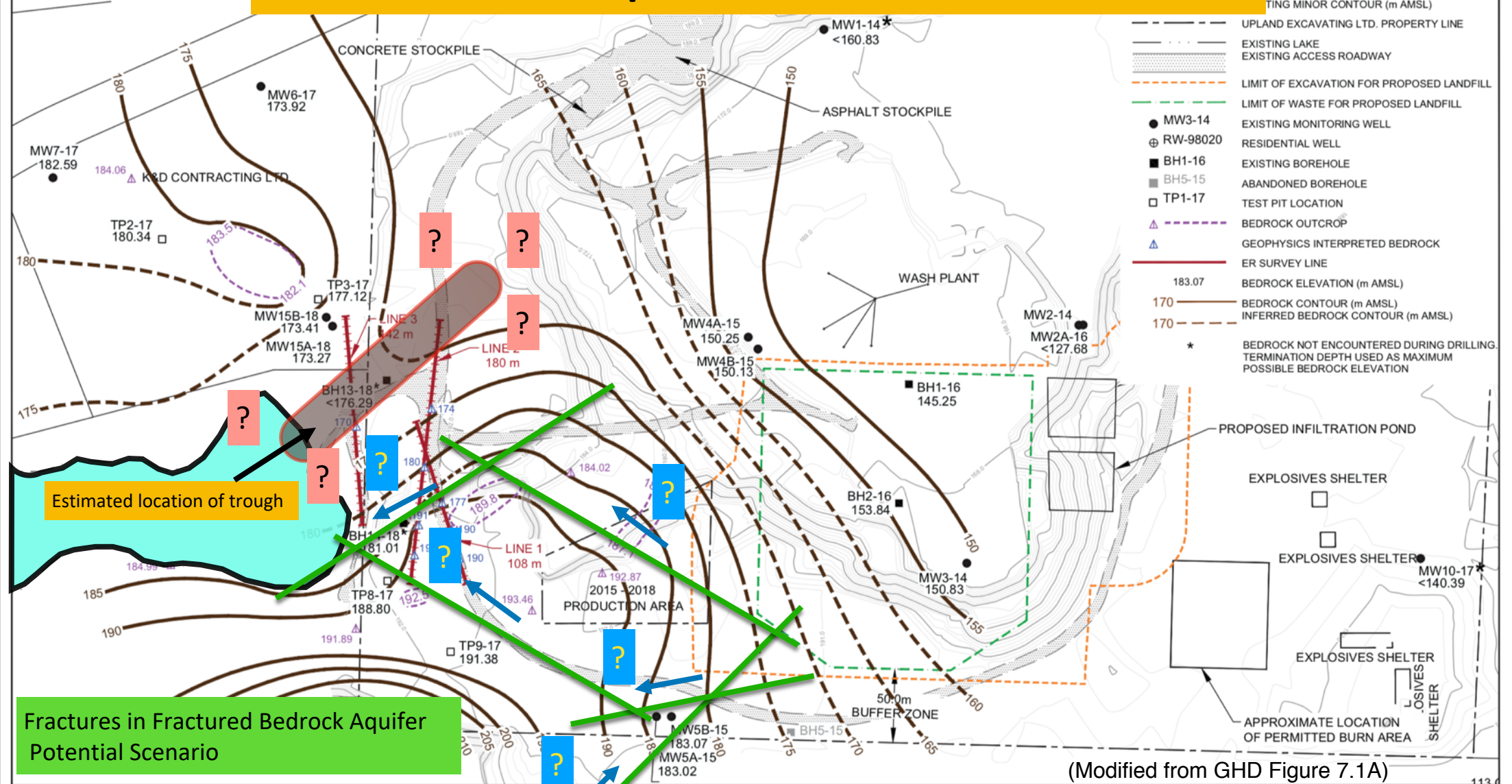


UPLAND EXCAVATING LTD.
 PROPOSED UPLAND LANDFILL
 HYDROGEOLOGIC AND HYDROLOGY CHARACTERIZATION REPORT
 CONCEPTUAL FLOW MODEL -
 SCHEMATIC CROSS-SECTION - WEST-SOUTHEAST

88877-03
 May 23, 2017
 8

FIGURE 3.0C

Flow in Bedrock Aquifer still not Characterized



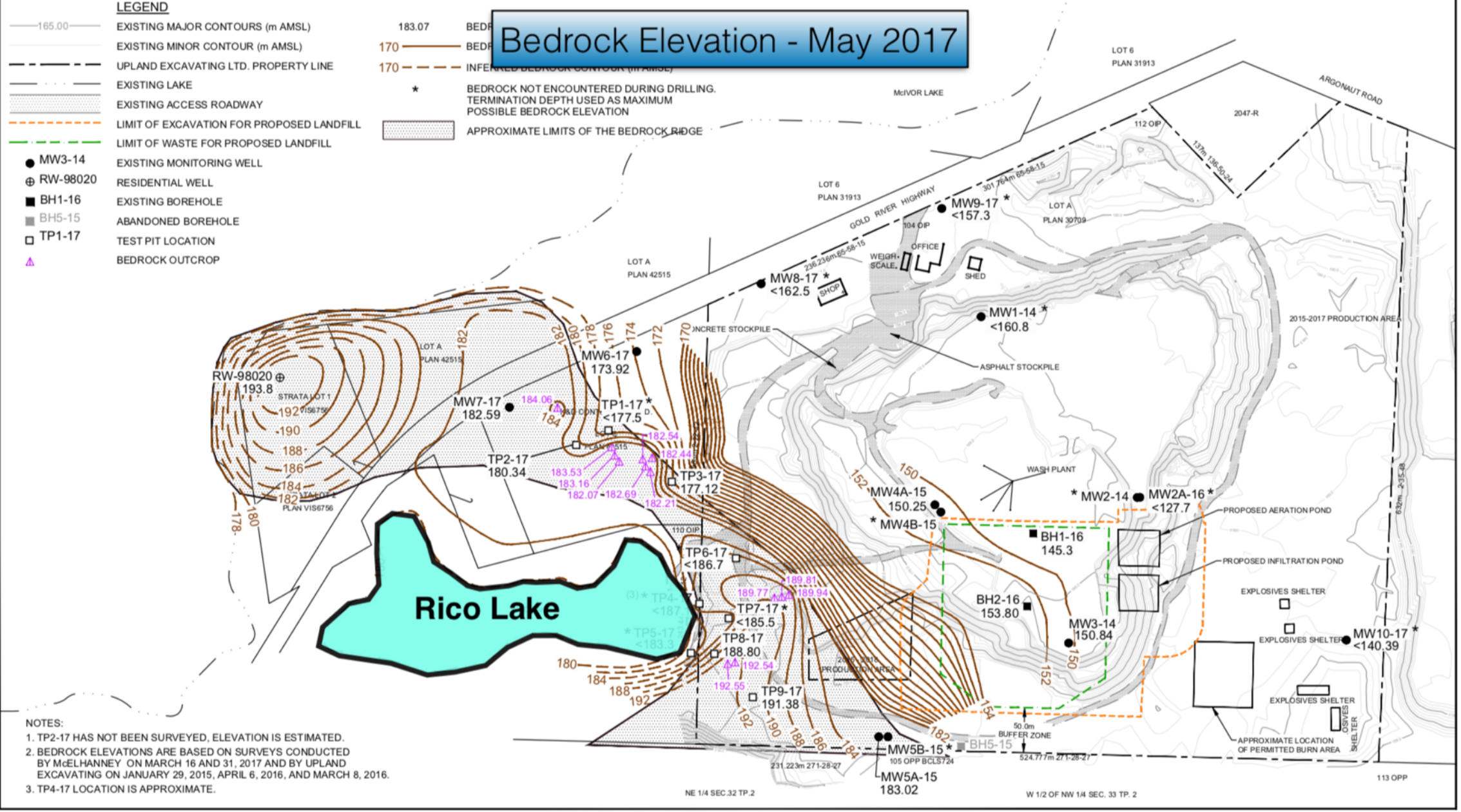
UPLAND EXCAVATING LTD.
PROPOSED UPLAND LANDFILL
CAMPBELL RIVER, BRITISH COLUMBIA

BEDROCK CONTOURS

088877-00
Dec 7, 2018

FIGURE 7.1A

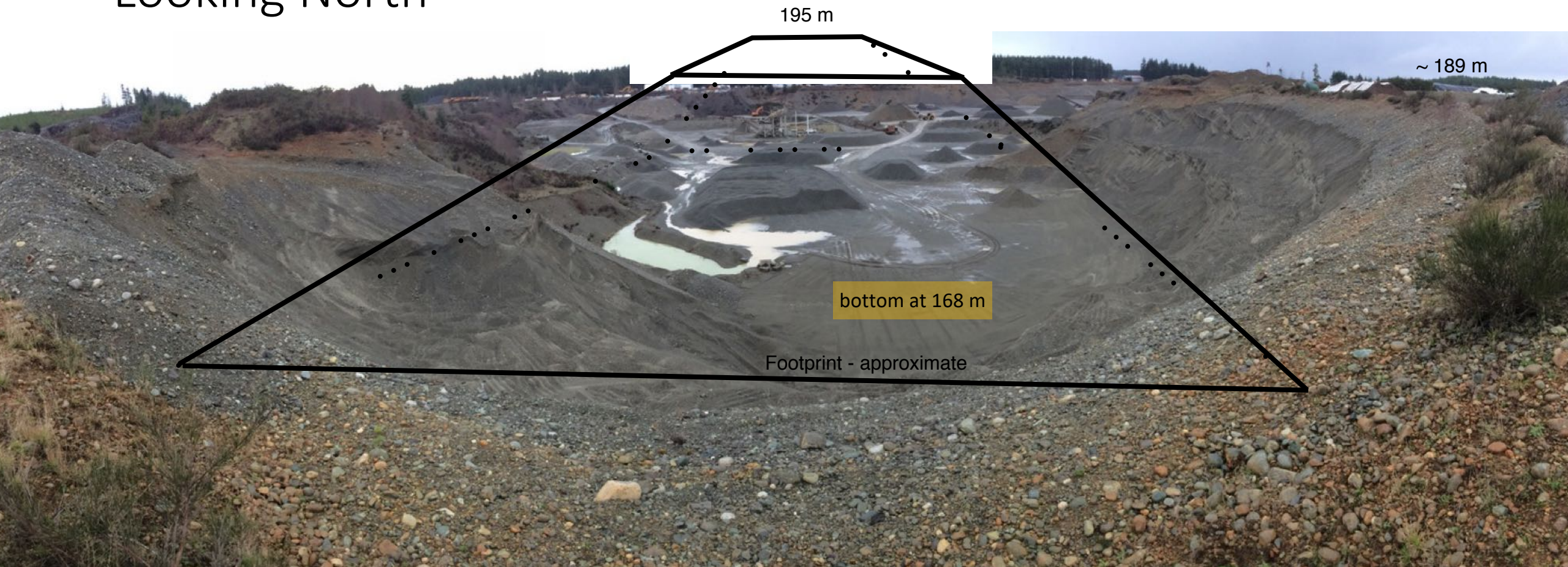
Bedrock Elevation - May 2017



KEY ISSUES

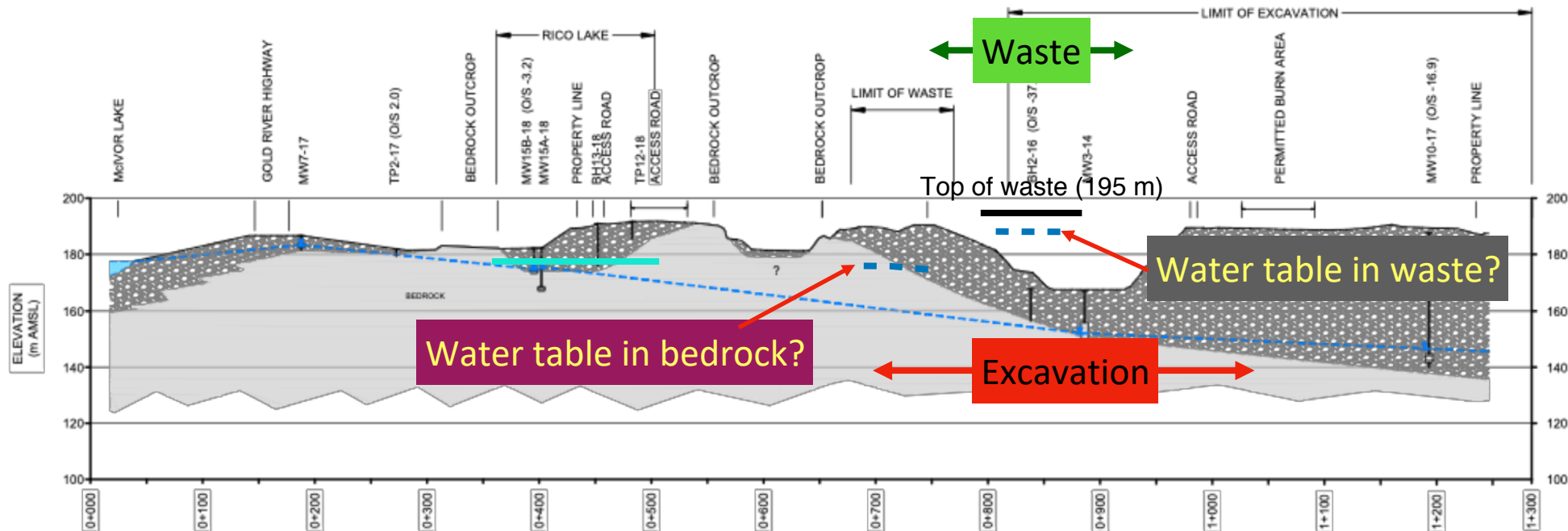
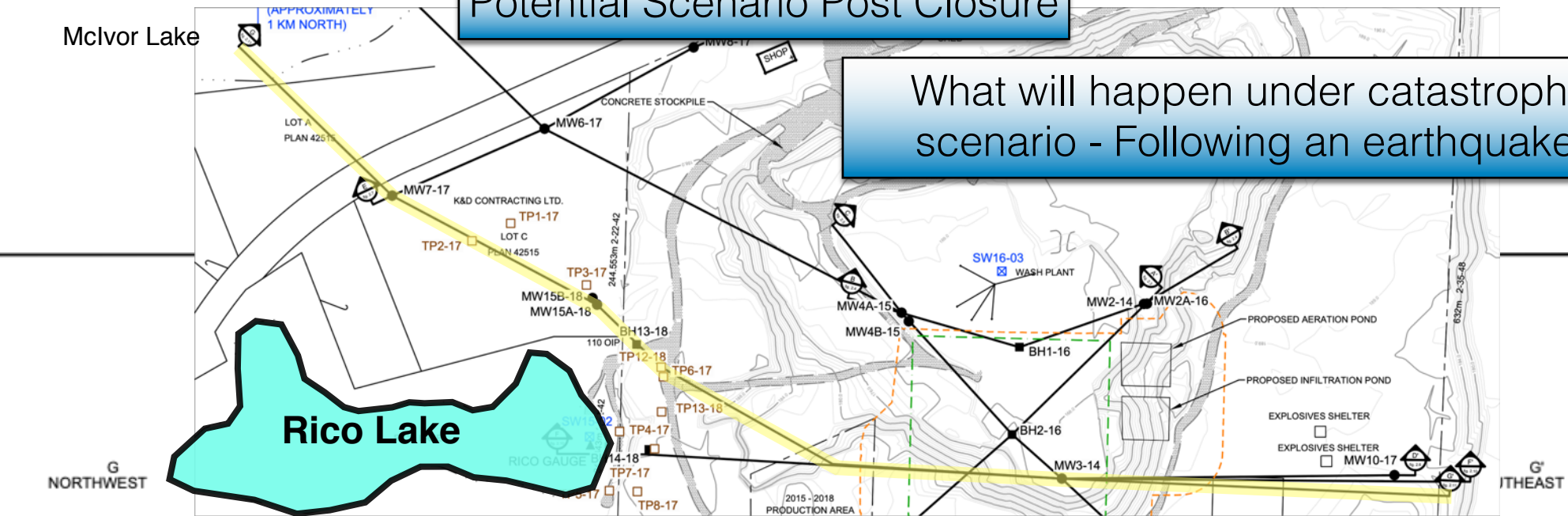
- Groundwater Flow in Bedrock
- **Risk of Impact to Rico Lake - Part of Drinking Water Source**
- High Water Table in Existing Pit

Looking North



Potential Scenario Post Closure

What will happen under catastrophic scenario - Following an earthquake?



(Modified from GHD Figure 2.11)

KEY ISSUES

- Groundwater Flow in Bedrock
- Risk of Impact to Rico Lake - Part of Drinking Water Source
- **High Water Table in Existing Pit**

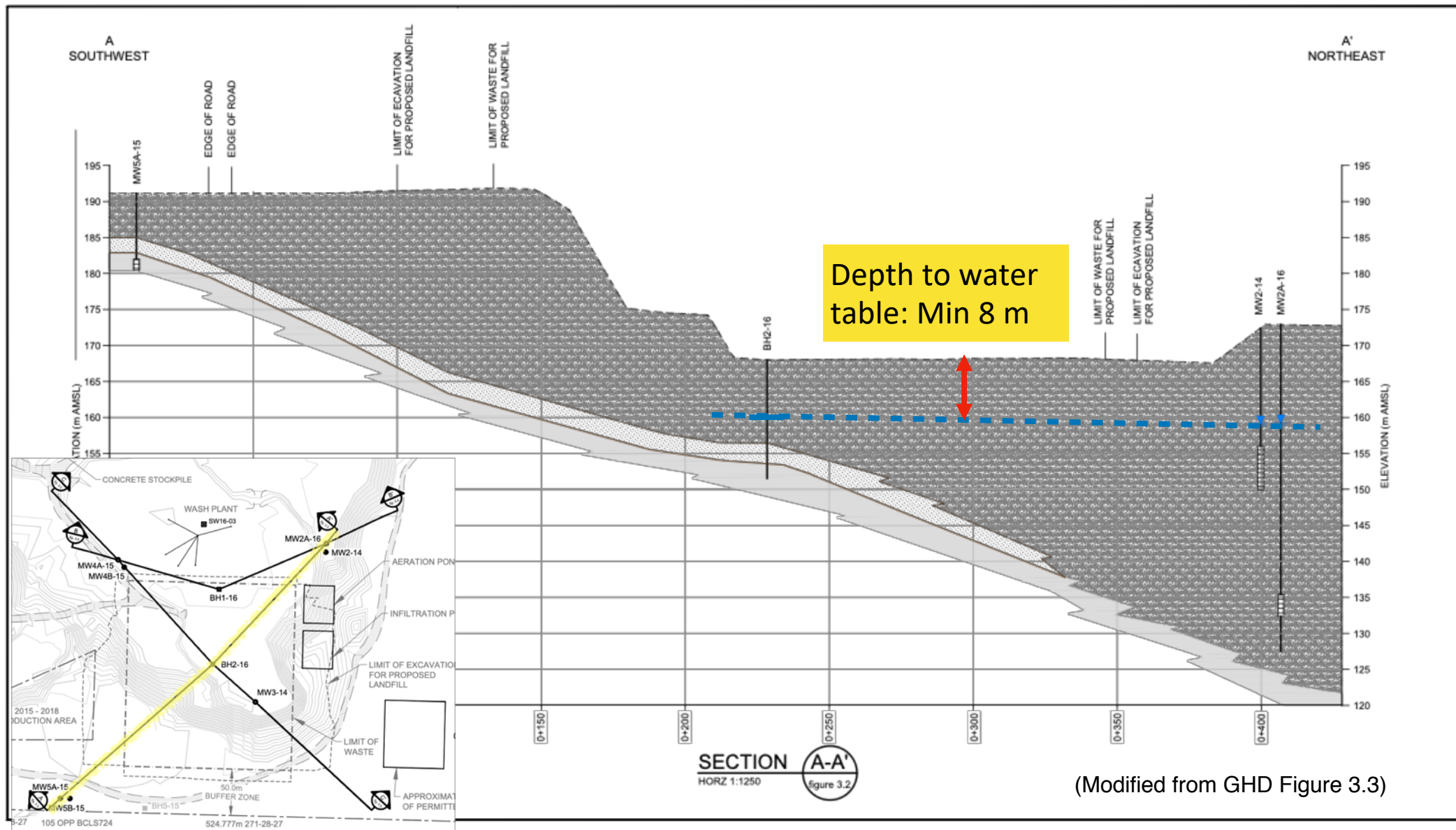
Looking North



Picture taken on December 11, 2018



Picture taken on December 11, 2018

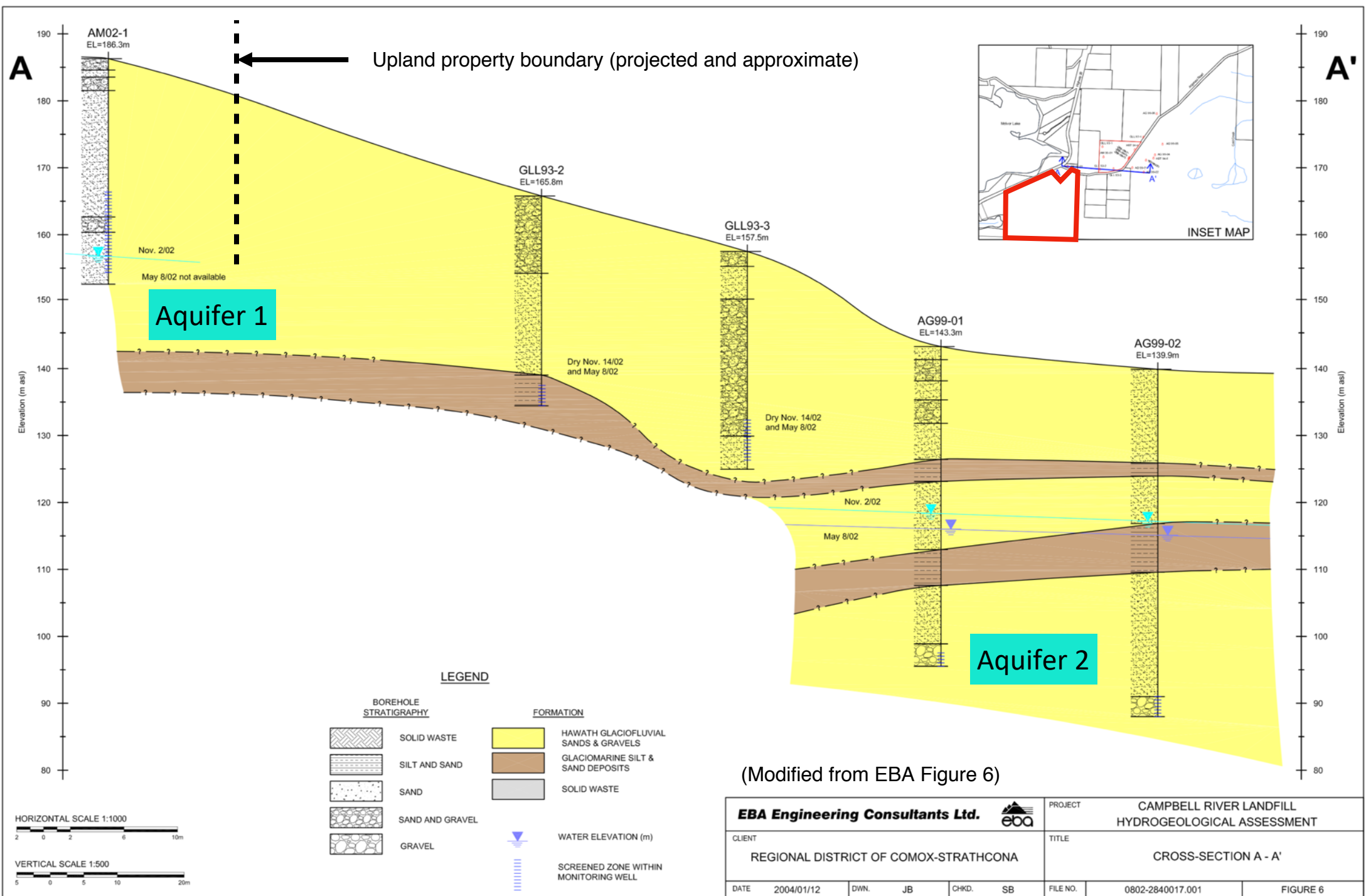


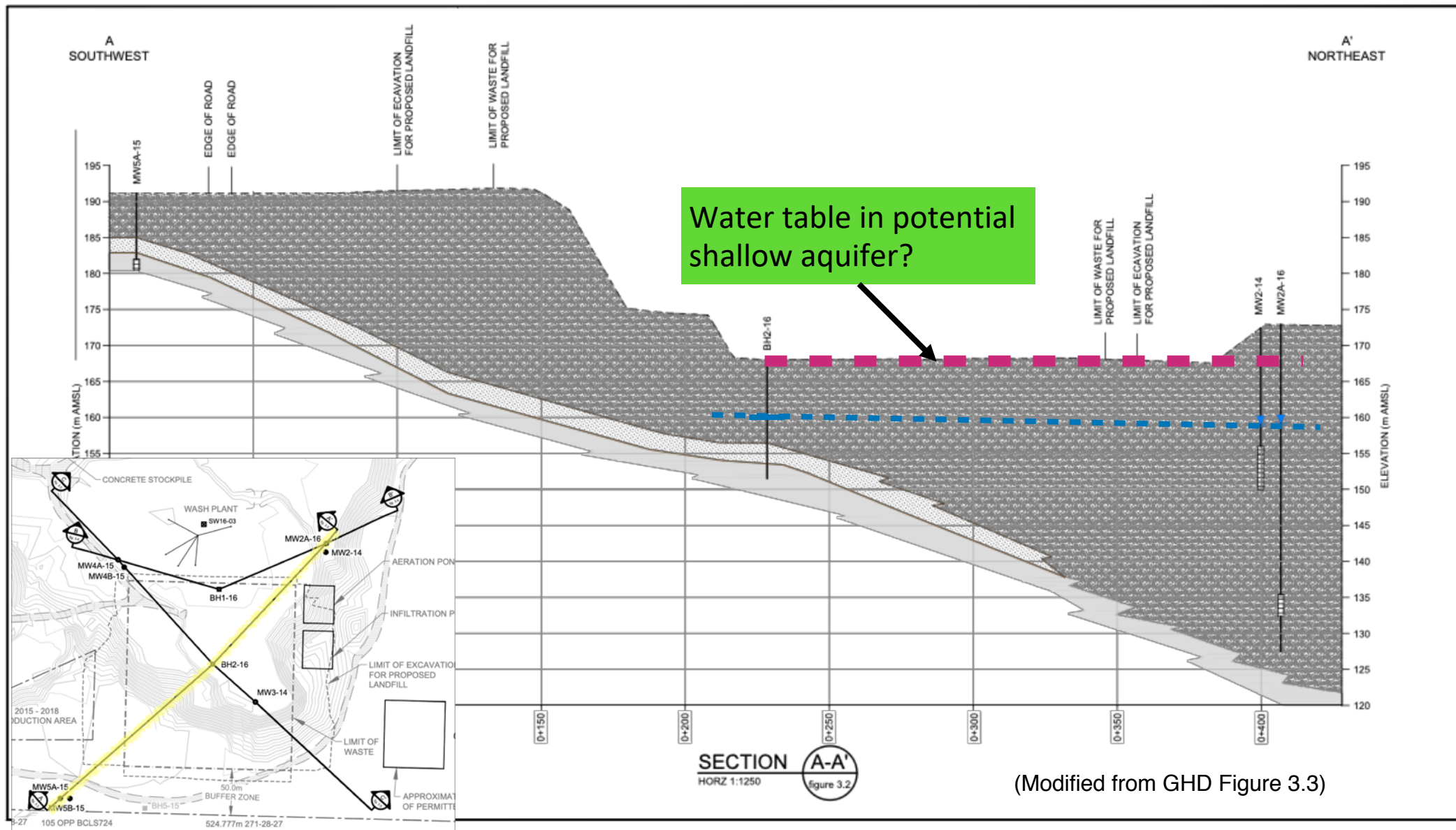
UPLAND EXCAVATING LTD.
PROPOSED UPLAND LANDFILL
HYDROGEOLOGIC AND HYDROLOGY CHARACTERIZATION REPORT

88877-02
May 26, 2016

CROSS-SECTION A-A'

FIGURE 3.3





KEY CONCERNS

- Role played by fractured bedrock aquifer: Risks of impact to Rico Lake and Campbell River water supply still exist.
 - Request of map describing water table in fractured bedrock (present and under catastrophic scenario).
- Hydraulic connection between Rico Lake and Landfill.
 - Should we reduce risk of impact to drinking water watersheds?
- Groundwater in sand and gravel aquifer(s) discharges into sensitive aquatic ecosystems.
 - What will be the situation under catastrophic scenario?
 - HELP model: Is it still reliable? Has FLNRORD completed external review?

KEY CONCERNS

- Presence / characterization of shallow aquifer may have been omitted
 - Gravel pit operations have to protect groundwater (Clearance)



Photo: Gilles Wendling

THANK YOU