



File No. 19-0370

November 18th, 2019

Central Coast Regional District (CCRD)
626 Cliff Street, PO Box 186
Bella Coola, BC V0T 1C0
Att: Ken McIlwain - CCRD Operations Manager
Via email: pwm@ccrd-bc.ca

cc. Mr. Jacob Scissons, P.ENG. (Urban System Ltd., jscissons@urbansystems.ca)

Dear Mr. McIlwain,

Re: Centennial Pool Upgrade Project 2019
Bella Coola, BC

1.0 Introduction

Fraser Valley Engineering Ltd. (FVEL) was retained by the client to conduct a geotechnical assessment for the proposed pool upgrade located at above mentioned address.

The purposes of FVEL's geotechnical assessment are to identify subsurface conditions, to determine the suitability of the site for the proposed pool and building addition, and to prepare geotechnical recommendations for structural design and construction of the project.

We understand that the proposed project consists of:

- Demolishing the existing pool
- Construction of a new pool
- Construction of an addition to the existing building

2.0 Geology and Geotechnical Investigation

Geological Survey of Canada Map 1329A - Surficial Geology, Bella Coola, BC shows that the site is located at the border of area 4 and 8 with alluvium deposits or till (undifferentiated).

The geotechnical investigation was done on October 31st, 2019 with a track mounted excavator to the maximum depth of approximately 7 feet. Three test pits close to proposed pool and building location were dug. Four additional test pits were dug for the purpose of perforation testing for the future septic system. The septic system will be designed by Urban Systems Ltd.

The subsurface conditions encountered in the excavated test pits are consistent with the alluvium surficial geology outlined above. Materials found in test pits generally consist of sand with sub round gravel and cobbles and in some



part trace of silt. Alluvium is loose, unconsolidated (not cemented together into a solid rock) soil or sediment that has been eroded, reshaped by water in some form, and re-deposited in a non-marine setting. Alluvium is typically made up of a variety of materials, including fine particles of silt and clay and larger particles of sand and gravel. However; no trace of clay was seen during our investigation and the silt amount in the test pits was minimal. Water table was found at approximately 1.2 m below the existing grade. Test pit logs and location plus percolation testing results are attached.

3.0 Geotechnical Recommendations

3.1 Site Preparation

Building Addition

As discussed above, the soil in the proposed pool and building addition areas consist of sub round gravel and cobbles with sand and trace of silt.

In the proposed pool and building addition areas, the existing topsoil or organic soil (if any) must be removed down into the native compact to dense sand and gravel. The excavation base should be reviewed by geotechnical personnel from our office. It is not anticipated, but if during the excavation process the soils are substantially disturbed, the sub-grade must be compacted after excavating to a minimum density of 100% based on the Standard Proctor Maximum Dry Density Test (SPMDDT).

Should the grade be raised to the design subgrade elevations, granular structural fill should be used subject to approval by the geotechnical engineer. The structural fill should be placed in lifts. Each lift should be not greater than 300 mm in thickness, and compacted to a minimum density of 100% based on the Standard Proctor Maximum Dry Density Test (SPMDDT).

FVEL must review the sub-grade once the excavation is completed, and monitor field densities during placement of structural fill.

FVEL must review the structural backfilling activities, prior to placing formwork, in order to verify its adequacy to support the proposed structures and to provide additional compaction recommendations, if required.

Pool

As per information provided by the client, there are two options for the proposed pool:

1. To build the bottom of the pool above exiting water table

If client choose to proceed with this option, site preparation can be done some as what mentioned above.

2. To have half of the pool below the water table and have a drainage valve/pipe at the bottom of the hole for releasing uplift pressure if needed (This method was used for the existing pool)

Given the site conditions, either option above is considered feasible.

Parking Lot

As per information provided by the client, the parking lot area will not be paved and the current gravel base of the parking area will be used for the future development. Based on this information, no further construction improvement is needed for the future parking area. However, if the future parking area is to be expanded beyond the existing parking area, the existing topsoil or organic soil (if any) must be removed down into the native compact to dense sand and gravel and be back filled with approved structural fill.

Excavated sand and sub round gravel can be used as structural fill upon approval by geotechnical engineer.

3.2 Bearing capacity estimation

Footings for the proposed pool and building founded on the native or structural fill as discussed above, can be designed with a factored Ultimate Limit State (ULS) bearing pressure of 150 kPa (3000 psf) in accordance with Table 8.2 of the Canadian Foundation Engineering Manual (CFEM). The Serviceability Limit State (SLS) pressure is 100 kPa (2000 psf). The minimum width of continuous footings should not be less than 0.45 m (18 inches) and the minimum dimension of column footings should not be less than 0.90 m (36 inches). A minimum embedment depth of 0.6 m (2 feet) must be provided for frost protection. For the proposed pool slab, a value of modulus of subgrade reaction of 40 MN/m³ may be used.

In terms of seismic design the Site Classification for this property is D – stiff soil (in accordance with the BC Building Code 2012, Table 4.1.8.4.A). The Peak Ground Acceleration (PGA) for this site is 0.081g for a probability of occurrence of 2% in 50 years (0.000404 per annum), which was obtained from the web-site <http://www.earthquakescanada.nrcan.gc.ca> of National Resources Canada. The Spectral Response Acceleration Values Sa(T), for Site Class C are:

Sa (0.05)	Sa (0.1)	Sa (0.2)	Sa (0.3)	Sa (0.5)	Sa (1.0)	Sa (2.0)	Sa (5.0)	Sa (10.0)	PGA (g)	PGV (m/s)
0.086	0.128	0.159	0.165	0.166	0.138	0.102	0.042	0.014	0.081	0.217

4.0 Construction field reviews

FVEL should review the final design to ensure that our recommendations have been incorporated into the design. We recommend that FVEL is retained for the following field reviews:

- Subgrade review
- Subgrade compaction, if required
- Fill material compaction, if required and verification of bearing capacity

5.0 Limitation

This report is based on the geotechnical investigation, a review of background information, and our knowledge of the area and the proposed project. We have prepared this report in substantial accordance with generally accepted geotechnical engineering practice, as it exists in the site area at the time of our study. No warranty is expressed or implied. This report may be used only by the client and the Central Coast Regional District only for the purposes stated, within a reasonable time from its issuance.



We trust that this letter provides you with the information required for the final design and construction. If you have any questions, please do not hesitate to contact us.

Yours truly,

Fraser Valley Engineering Ltd.

Reviewed by,

Larry Deng, M.Sc., P.Eng
Senior Geotechnical Engineer, Principal

Nov 18, 2019

Hamid Tavakolian Bana, M.Eng, EIT.
Geotechnical Engineer

Attachments:

- Test pit locations layout
- Test pit Logs



TP No.	Depth (ft)	Soil description
TP1	0.0-0.5	Grass and top soil
	0.5-6.0	Gravel and cobbles, sun round, looks like a trench backfilling, some sand, cave in from 1 ft to bottom of hole, gravel size decrease in size by increase in depth
		10 m from building corner
		Water table @ 4.5 ft from grade
TP2	0.0-0.5	Grass and top soil
	0.5-2.5	Silty sand, damp to moist, loose to compact, light brown
	2.5-6.0	Gravel and cobble with sand, grey, this material was typical of area as per hoe operator and Ken
		Water table @ 4.0 ft from grade
		18 m from SW of fence corner, 14 m from SE of fence corner
TP7	0.0-0.5	Grass and top soil
	0.5-1.5	Fine and with some silt, loose to compact
	1.5-7.0	Gravel and cobbles, some sand, fine to medium in size
		8.5 m from SW fence corner
		Water table @ 5.5 ft from grade

Notes:

- All test p depths are below existing ground surface.
- TP3, 4, 5 and 6 will be in the separate report



**CENTRAL COAST REGIONAL DISTRICT
CENTENNIAL POOL**

SITE PLAN FOR CENTENNIAL POOL RENEWAL PROJECT 2019 - 2021

Scale 1:300	CCRD OPERATIONS DEPT. RECREATION INFRASTRUCTURE
	DATE OF SURVEY: OCTOBER 28, 2019
Legend	FIELD CREW: KIM AE
— SURVEYED PARCELS	DATA ON RECORD: KEN MCILWAIN
— EXISTING BUILDING FOOTPRINT	CHECKED BY: KEN MCILWAIN
— EXISTING POWERLINE	DRAWING NO.: P2019-04
— EXISTING POOL TANK	DATE OF ISSUE: NOVEMBER 8, 2019
— EXISTING ROAD	REVISION NO.:
— EXISTING FENCE	PLAN SCALE: 1:500
— MAJOR CONTOUR (1.0 m)	SHEET: 1 OF 1
— INTERMEDIATE CONTOUR (0.3 m)	

