



February 19, 2019

Reference: VAN-00251326-A0

UBC Project Services  
1100 – 2329 West Mall  
Vancouver, BC V6T 1Z4

Email: kate.west@ubc.ca

Attention: Kate West, Project Manager

**Re: Geotechnical Assessment Report - Revision 1  
Proposed Modular Counselling Building  
University of British Columbia, Vancouver, BC**

Dear Ms. West:

## **1.0 INTRODUCTION**

EXP Services Inc. (EXP) was retained by UBC Project Services ("UBC") to prepare this revised geotechnical engineering assessment report for construction of a temporary modular building which will be located next to Brook Hall East at 1874 East Mall, in UBC Vancouver campus. The location of the project site is shown on the attached Figure 1. The Terms of Reference for this geotechnical assessment were provided in EXP's Proposal 999-00063770-PP dated January 24, 2019. The purpose of this geotechnical assessment was to evaluate the subsurface conditions at the site and develop geotechnical engineering recommendations for the proposed development.

Our original report dated February 15, 2019 was based on temporary foundation system comprising of standard wood crib blocks installed on a pressure treated wooden mats. UBC reviewed our report and provided comment to include shallow concrete footing as temporary foundation system for the proposed modular building. This report has been revised in order to include recommendations for shallow concrete pier foundations and supersedes our original report.

Our scope of services for this project included review of the Geological Survey of Canada surficial geology map covering the subject site, conducting a desktop study of the available information with respect to site soil and groundwater conditions, site development history, conducting a subsurface investigation in the area of the proposed construction, performing geotechnical analyses, and preparation of this report providing geotechnical engineering recommendations for the proposed construction. Our scope of services did not include assessment of site soil or groundwater with respect to environmental considerations.

## **2.0 SITE DESCRIPTION AND PROPOSED CONSTRUCTION**

The subject site is located on the south side of Brock Hall West Building in the UBC Vancouver Campus. The site is bounded by Brock Hall West Building to the northwest, Brock Hall East Building to the northeast, and pedestrian walkway to the southwest and southeast. The site is generally covered with grass and occasional shrubs, with an access road cutting through the site from the east corner to west corner of the site. The access road is partly gravel surfaced and partly paved. The width of the access is about 4.5m. Based on Google Imagery dated July 22, 2018, the north part of the site was previously occupied by one-story office trailer that has been recently removed. The site slopes gently downward from the east to west.

It is understood that the proposed development at the subject site will consist of construction of a modular building. A Schematic Design Report/Owner's Statement Requirements of the proposed construction was

forwarded to us by UBC. The footprint area of the proposed new modular building is approximately 4,650 sq.ft. (~432.2m<sup>2</sup>) and is expected to remain in place for three (3) to five (5) years and may be relocated to an alternate site afterwards. The proposed building will be utilized to accommodate some aspects of student counselling services. Based on our review of the schematic Design Report, we understand that the modular building would be supported on temporary foundations.

We understand that temporary foundations for the proposed modular building will either consist of shallow concrete footing (Option1), or standard wood crib blocks installed on a pressure treated wooden mats (Option 2). It should be noted that concrete footings would provide better performance with respect to deterioration (i.e. even treated timber could still rot with time).

We also understand that the project will be delivered via a Design-Build (D-B) Project Delivery method. This geotechnical engineering assessment report would be included in the formal Request for Proposal (RFP) for D-B proponents

### **3.0 SUBSURFACE EXPLORATION**

The subsurface exploration program at the site was conducted on January 30, 2019 and comprised a total of four (4) shallow manually excavated test pits (TP19-01 to TP19-04). Dynamic Cone Penetration Tests (DCPTs) using a manually operated KSE Dynamic Cone Penetrometer were also conducted adjacent to the test pits TP19-01 to TP19-03. The test pits extended to depths of about 1.1m to 1.4m, below existing grade. DCPTs extended to depths ranging from about 0.9m to 1.4m, below grade. The measured DCPT blow counts were correlated into equivalent Standard Penetration Test N-values in blows/305 mm for assessing the geotechnical soil properties for design purposes. The approximate locations of the test pits are shown on the attached Figure 1.

The soil conditions encountered at the test pits were logged in the field by a member of EXP's geotechnical staff. Representative soil samples collected at select depths of the test pits were returned to our laboratory for visual classification and moisture content determination purpose. The test pits were backfilled with the excavated soils and nominally compacted with a tamper, immediately upon completion of logging of the soils.

Soil logs with description of the soil and groundwater conditions encountered at the test pits are attached to this report. The equivalent SPT N-values and moisture content test results are illustrated on the attached soil logs. A summary description of the soil and groundwater conditions at the site is provided in the following section of this report. A detailed description of the subsurface conditions is provided on the attached soil logs and should be used in preference to the general summary of soil conditions provided below.

It should be noted that the test pit soil logs indicate subsurface conditions encountered at the respective test pit locations only. The subsurface conditions may vary outside the test pit locations and below the depth explored.

### **4.0 SOIL AND GROUNDWATER CONDITIONS**

#### **4.1 Surficial Geology**

Based on the Geological Survey of Canada surficial geology map covering the project site (Map 1486A), the native soils at the site comprised of Vashon Drift and Capilano Sediments (Vibe). The VCb units are described as lodgement and minor flow till, lenses, and interbeds of sub-stratified glacio-fluvial sand and gravel, and lenses and interbeds of glacio-lacustrine laminated stony silts.

## **4.2 EXP Test Holes**

Test pits TP19-01 and TP19-02 encountered approximately 300mm thick surficial layer of organic silt / topsoil. The ground surface at the location of TP19-03 was surfaced with about 100mm thick road base material. TP19-04 was terminated at 1.1m below grade due to refusal to manual digging. At TP19-04, fill comprising of silty sand, mixed with some gravel was encountered at the surface.

Soils underlying the above-mentioned surficial layer encountered in the test pits comprised of fill extended to the bottom of the test pits. Fill was comprised of sand and gravel / sand / gravel / sandy gravel. Based on the field DCP blow counts and their equivalent SPT–N values, the relative density of the encountered fill was judged to be generally compact. Moisture contents measured on the soil samples collected from the fill layer ranged from 4 to 13 percent.

No groundwater seepage was observed in any of the test pits at the time they were remained open.

## **5.0 DISCUSSION AND RECOMMENDATIONS**

### **5.1 General**

Based on the subsurface conditions at the subject site inferred from the EXP test holes, EXP confirms that the proposed temporary modular building may be supported on shallow temporary foundations, consisting of wither concrete or pressure treated timber pads. The design should incorporate proper ventilation and grading under the modular building to protect the wooden supports from rot.

The trailer may need temporary anchors against wind / seismic. Recommendations for the anchor design can be provided when the anchor type has been selected.

### **5.2 Site Preparation**

Site preparation in the area of the proposed support / footing locations should consist of the removal of any vegetation, topsoil, any existing asphalt, and any existing fill to 450mm below the existing grade.

The excavation to remove the unsuitable materials should extend horizontally, a distance at least equal to the depth of the excavation. We recommend that the exposed subgrade be surficially compacted with vibratory equipment, prior to the placement of any fill, to densify soils disturbed during stripping and excavation. Geotechnical Engineer should review and approve the subgrade prepared as discussed above. Following the excavation, the timber pads should be placed over a 19mm minus sandy gravel with less than 5% fines content, placed and compacted to 95% of material's Modified Proctor Maximum Dry Density (MPMDD) in discrete lifts.

In areas of any new on-site pavement, it will only be necessary to excavate to a sufficient depth to allow for construction of the pavement structure discussed in Section 5.7 of this report. Where the exposed subgrade in new on-site pavement areas consists of granular soil, it should be surficially compacted with a large, smooth drum vibratory roller. We recommend that the subgrade for on-site pavement areas be proof-rolled with a loaded dump truck under the review of the Geotechnical Engineer. Areas that exhibit excessive deflection or rutting should be sub-excavated as directed by the Geotechnical Engineer and grade reinstated with compacted structural fill as described below.

It is recommended that finished site grade within the building footprint area be raised to 100mm above the finished exterior grade and that exterior grade be sloped away from the building area.

### **5.3 Temporary Excavation and Construction De-watering**

Temporary unsupported excavations at the site should be conducted in accordance with WorkSafe BC regulations. An allowable inclination of 1H:1V (Horizontal:Vertical) is considered appropriate for temporary excavations between 1.2 m and 2 m in depth in the site soils where worker access is required. The inclination of the temporary excavations may need to be reduced where loose soils or seepage are encountered. All temporary excavations steeper than 1H:1V, or deeper than 2 m, should be approved in writing by a Geotechnical Engineer prior to workers approaching or entering such excavations.

It is anticipated that any groundwater and rainwater entering temporary excavations could be adequately controlled using sumps and pumps. Discharge of water collected from temporary excavations should be conducted in accordance with the UBC's requirements. The excavation should be graded to direct surface water to the temporary sumps.

It is anticipated that conventional excavation equipment can be used to excavate soils as encountered in the test pits at the site.

### **5.4 Structural Fill**

Structural fill is defined in this report as fill material used to develop site grades beneath foundations, sidewalks, and other hard surfaced areas (including asphalt pavement). Imported structural fill should consist of free draining, well graded, 75mm minus pit run sand and gravel pit run with a maximum 5 percent fines (material passing the 0.075mm sieve) by weight, or equivalent approved by the Geotechnical Engineer. The Geotechnical Engineer should be given the opportunity to approve candidate sources of engineered fill, prior to their delivery to the site, to assess their suitability for use.

Structural fill should be placed in loose lifts not exceeding 300mm in thickness when a self-propelled vibratory smooth drummed roller is used to compact the material. The maximum lift thickness should be reduced to 200mm where a walk behind plate tamper is used for compaction.

All structural fill should be compacted to not less than 95 percent of its Modified Proctor maximum dry density (MPMDD) per ASTM D 1557. The structural fill should extend out from all load bearing areas a horizontal distance at least equal to the thickness of structural fill placed below the load bearing areas. The Geotechnical Engineer should conduct in-situ soil density testing on the engineered fill as it is being placed to confirm that adequate compaction is achieved.

It is our opinion that the existing near surface sand and gravel/sand fill, encountered at the test pits, except silty sand encountered in TP19-03 may be suitable for re-use as structural fill. Any existing fill proposed to re-use as structural fill should be reviewed and approved by the Geotechnical Engineer.

### **5.5 Soil Bearing Resistances at Temporary Foundation Support Locations**

As discussed above, the modular building may be supported on Option 1 or Option 2 as described above. EXP conducted soil bearing capacity analyses to verify the available soil bearing resistance at each support location based on the inferred soil conditions as described above. The results of the analyses are summarized below:

**Option 1 (shallow concrete piers):** Our analysis was based on the following assumptions.

1. The concrete shallow foundations have a minimum diameter or size of 600mm;

2. A minimum foundation embedment of 600mm, below finished grade;
3. The loads imposed on the foundation acted at a fixed position in the central region at the top of the foundation;
4. Vertical shaft resistance along the perimeter of the piers was ignored in the analysis; and
5. The foundation subgrade comprises existing compact fill soils.

The recommended factored Ultimate Limit State (ULS) bearing resistances for the above foundations placed on the existing compact fill may be designed using a Serviceability Limit State (SLS) soil bearing resistance of 150 kPa and a factored Ultimate Limit State (ULS) soil bearing resistance of 225 kPa. The Geotechnical Engineer should review the soil conditions at foundation grade prior to the construction of foundation formwork.

**Option 2 (standard wooden pier supports):** Results of bearing capacity analysis indicate that each support if installed on compacted gravel as per recommendations provided earlier may be designed using a Serviceability Limit State (SLS) soil bearing resistance of 60 kPa and a factored Ultimate Limit State (ULS) soil bearing resistance of 90 kPa. If the above support systems are placed on a 65mm thick asphalt pavement then 100 kPa and 150 kPa can be utilized as SLS and ULS soil bearing resistances, respectively. The above values are based on minimum plan dimensions of 600mm x 600mm for wooden mats.

## 5.6 Settlement

Assuming site preparation is conducted as discussed above, total post-construction settlement of foundations designed based on the SLS soil bearing resistance provided above is not expected to exceed 25mm under static loading conditions. Differential post-construction settlement is not expected to exceed 20mm over a horizontal distance of 10m for the static loading case.

When available, building loading and site grading information should be provided to us so that we can confirm or, if necessary, modify the estimates of potential post-construction settlement provided herein.

## 5.7 On-site Asphalt Pavement

If required, the following structure for on-site asphalt pavement parking areas and light-vehicle driveways is recommended:

- 65mm of asphaltic concrete; underlain by,
- 100mm of 19mm minus crushed gravel base course, compacted to not less than 95 percent of the material's MPMDD; underlain by,
- 300mm of 75mm minus pit run sand and gravel subbase course compacted to not less than 95 percent of the material's MPMDD; underlain by,
- Geotechnical Engineer approved subgrade or compacted structural fill placed over Geotechnical Engineer approved subgrade.

We recommend that the granular subbase and base materials meet the gradation requirements for these materials contained in the Master Municipal Construction Documents (MMCD) Volume II (Platinum Edition) Section 31 05 17 (2.8) and 31 05 17 (2.10) respectively. They should be placed in discrete lifts and be compacted to not less than 95% MPMDD, as confirmed by in-situ soil density testing.

It is recommended that the Geotechnical Engineer review and approve candidate subbase and base materials prior to their placement at the site. This should include sieve analysis and Modified Proctor testing of representative samples of the candidate fill materials.

## **6.0 GEOTECHNICAL ENGINEERING REVIEW**

This geotechnical report is based on available information at the time this report was prepared. As building concepts and design are finalized, EXP should be provided the opportunity to review and comment from a geotechnical perspective to assess and revise the recommendations made herein, as necessary.

We recommend that the Geotechnical Engineer be provided with the opportunity to review the following:

- Building layout, site grading plan, support plan and loading information. EXP may need to revise the geotechnical recommendations provided in this report, based on this information;
- Review of stripped and prepared subgrades prior to placement of fill;
- Review of candidate engineered fill and pavement sub-base / base course fill materials; and
- *In-situ* soil density testing on engineered fill and sub-base / base course fills.

## **7.0 CLOSURE**

Please note that this report has been prepared based on the information provided by the Client and our understanding of the proposed development as described in Section 1.0 above.

Also note that this report was prepared for the exclusive use of our Client, University of British Columbia and their designated agents, and may not be used by other parties without written consent of EXP. A copy of our "Interpretation & Use of Study and Report" is enclosed. These instructions form an integral part of this report and must be included with any copies of this report.

The soil and groundwater conditions described in this report and on the attached soil logs are those encountered at discrete test hole locations. Actual soil and groundwater conditions at the site may vary from those encountered at the test holes. Contractors should make their own assessment of subsurface conditions and select the construction means and methods most appropriate to the site conditions. This geotechnical report should not be included in contract specifications without suitable qualifications and prior review by EXP Services Inc. However, the geotechnical report may be used as an attachment to contract specifications, for information purposes only.

EXP Services Inc.

*Geotechnical Assessment Report - Proposed Modular Counselling Services Building – Revision 1*  
UBC Vancouver Campus, BC  
Reference No.: VAN-00251326-A0  
February 19, 2019

We trust the information provided in this report meets with your immediate requirements. If you have any questions or require further information, please contact the undersigned


Sincerely,

EXP Services Inc.

Reviewed by:

A circular professional engineer seal for the Province of British Columbia. The seal contains the text "PROFESSIONAL ENGINEER OF BRITISH COLUMBIA" around the perimeter. In the center, it reads "P. K. SAHA # 39583". A blue ink signature is written across the seal, and the date "Feb 19, 2019" is handwritten in blue ink to the right of the seal.

Pranay Saha, M.Eng., P.Eng.  
Geotechnical Engineer



Kai-Sing Hui, P.Eng.  
Manager, Geotechnical Division

Enclosures: Interpretation & Use of Study and Report  
Figure 1: Testhole Location Plan  
Appendix A: Test pit Logs (TP19-01 to TP19-04)

L:\2019 (0251002-A0...)\0251326-A0 PS UBC Modular Building UBC, Vancouver\60 Project Execution\61 Docs\Rpt\251326 exp 2019 02 19 Geo Assessment Modular Counselling Building - Revision 1.docx

EXP Services Inc.

*Geotechnical Assessment Report - Proposed Modular Counselling Services Building – Revision 1*  
*UBC Vancouver Campus, BC*  
*Reference No.: VAN-00251326-A0*  
*February 19, 2019*

---

## Appendix A

### **Test pit Logs** TP19-01 to TP19-04





## **INTERPRETATION & USE OF STUDY AND REPORT**

### **1. STANDARD OF CARE**

This study and Report have been prepared in accordance with generally accepted engineering consulting practices in this area. No other warranty, expressed or implied, is made. Engineering studies and reports do not include environmental consulting unless specifically stated in the engineering report.

### **2. COMPLETE REPORT**

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report which is of a summary nature and is not intended to stand alone without reference to the instructions given to us by the Client, communications between us and the Client, and to any other reports, writings, proposals or documents prepared by us for the Client relative to the specific site described herein, all of which constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. WE CANNOT BE RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

### **3. BASIS OF THE REPORT**

The Report has been prepared for the specific site, development, building, design or building assessment objectives and purpose that were described to us by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document are only valid to the extent that there has been no material alteration to or variation from any of the said descriptions provided to us unless we are specifically requested by the Client to review and revise the Report in light of such alteration or variation.

### **4. USE OF THE REPORT**

The information and opinions expressed in the Report, or any document forming the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT OUR WRITTEN CONSENT. WE WILL CONSENT TO ANY REASONABLE REQUEST BY THE CLIENT TO APPROVE THE USE OF THIS REPORT BY OTHER PARTIES AS "APPROVED USERS". The contents of the Report remain our copyright property and we authorise only the Client and Approved Users to make copies of the Report only in such quantities as are reasonably necessary for the use of the Report by those parties. The Client and Approved Users may not give, lend, sell or otherwise make the Report, or any portion thereof, available to any party without our written permission. Any use which a third party makes of the Report, or any portion of the Report, are the sole responsibility of such third parties. We accept no responsibility for damages suffered by any third party resulting from unauthorised use of the Report.

### **5. INTERPRETATION OF THE REPORT**

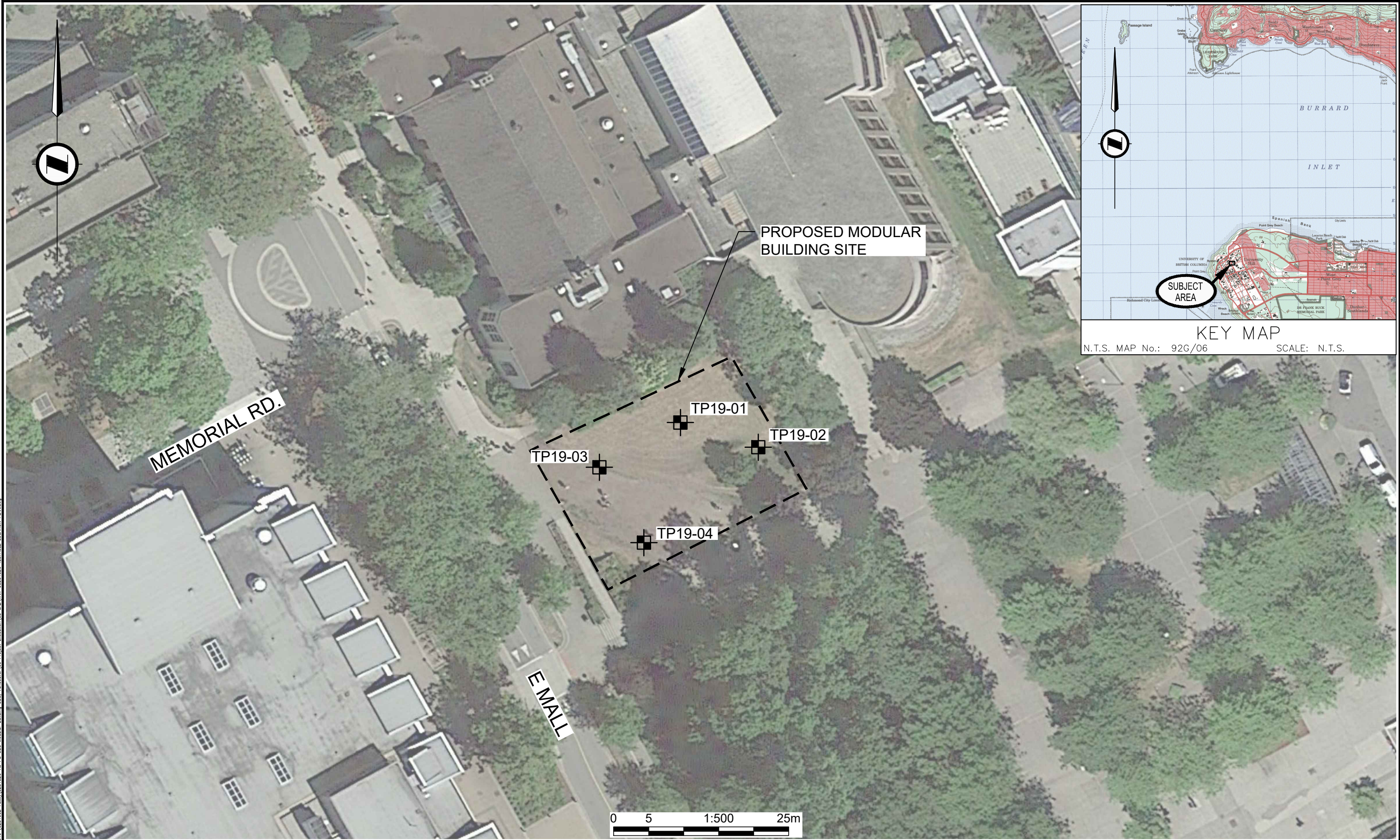
- a. Nature and Exactness of Descriptions: Classification and identification of soils, rocks, geological units, contaminant materials, building envelopment assessments, and engineering estimates have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature and even comprehensive sampling and testing programs, implemented with the appropriate equipment by experienced personnel, may fail to locate some conditions. All investigations, or building envelope descriptions, utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarising such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and all persons making use of such documents or records should be aware of, and accept, this risk. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- b. Reliance on Provided information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in the report as a result of misstatements, omissions, misrepresentations or fraudulent acts of persons providing information.
- c. To avoid misunderstandings, EXP Services Inc. (EXP) should be retained to work with the other design professionals to explain relevant engineering findings and to review their plans, drawings, and specifications relative to engineering issues pertaining to consulting services provided by EXP. Further, EXP should be retained to provide field reviews during the construction, consistent with building codes guidelines and generally accepted practices. Where applicable, the field services recommended for the project are the minimum necessary to ascertain that the Contractor's work is being carried out in general conformity with EXP's recommendations. Any reduction from the level of services normally recommended will result in EXP providing qualified opinions regarding adequacy of the work.

### **6.0 ALTERNATE REPORT FORMAT**

When EXP submits both electronic file and hard copies of reports, drawings and other documents and deliverables (EXP'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 EXP shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancy, 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 EXP shall be deemed to be the overall original for the Project.

The Client agrees that both electronic file and hard copy versions of EXP's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EXP. The Client warrants that EXP's instruments of professional service will be used only and exactly as submitted by EXP.

The Client recognizes and agrees that electronic files submitted by EXP have been prepared and submitted using specific software and hardware systems. EXP makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.



Feb 06, 2019 - 2:35pm L:\2019 (0251002-A0, 0251326-A0, PS, UBC Modular Building UBC, Vancouver) (6, Project Execution) 65\_P20(VAN-0251326 TESTHOLE LOCATION PLAN.dwg



**EXP Services Inc.**  
275-3001 Wayburne Drive  
Burnaby, BC V5G 4W3  
Telephone: 604-874-1245  
Fax: 604-874-2358  
www.exp.com

|   |           |             |      |
|---|-----------|-------------|------|
| DFTR.<br>PDL<br>DSGN.<br>JZ<br>CHK.<br>PS | REVISIONS |             |      |
|   | No.       | DESCRIPTION | DATE |
|   |           |             |      |
|   |           |             |      |

|   |
|---|
| CLIENT<br>UBC INFRASTRUCTURE DEVELOPMENT, PROJECT SERVICES  |
| PROJECT<br>PROPOSED MODULAR COUNSELLING SERVICES BUILDING<br>UNIVERSITY OF BRITISH COLUMBIA, B.C. |
| PROJECT NO.<br>VAN-00251326-A0  |

|                                  |                 |                     |  |
|----------------------------------|-----------------|---------------------|--|
| TITLE:<br>TESTHOLE LOCATION PLAN |                 |                     |  |
| DATE<br>2019-02-06               | SCALE:<br>1:500 | DWG NO.<br>FIGURE 1 |  |



EXP Services Inc  
3001 Wayburne Drive Unit 175A & Unit 275  
Burnaby, Colombie-Britannique V5G 4W3  
Telephone: 604-874-1245

# RECORD OF TEST PIT : TP19-01

PAGE 1 OF 1

PROJECT NUMBER VAN-00251326-A0

PROJECT NAME Proposed Modular Counselling Building

EXCAVATION DATE 2019-01-30

EXCAVATION CONTRACTOR \_\_\_\_\_

EXCAVATION METHOD Hand Pit

EQUIPMENT TYPE Shovel

LOGGED BY JZ CHECKED BY PS

CLIENT University of British Columbia

PROJECT LOCATION 1874 East Mall, UBC Vancouver Campus

TEST PIT LOCATION ZONE: 10 N: 5457307 E: 481664.2

ELEVATION (approximate)

GROUND WATER DEPTHS: ▽ AT TIME OF EXCAVATION ---

▽ AT END OF EXCAVATION --- no groundwater encountered

▽ AFTER EXCAVATION ---

| DEPTH<br>(m) | STRATA | SOIL DESCRIPTION  | ELEV.<br>DEPTH<br>(m) | SAMPLES |      |            | SPT N VALUE<br>BLOWS/0.3m<br>▲<br>20 40 60 80<br>DYNAMIC CONE<br>BLOWS/0.3m<br>◻<br>20 40 60 80 | POCKET PEN.<br>(kPa)<br>●<br>100 200 300 400<br>FIELD VANE<br>SHEAR (kPa)<br>Peak Remold<br>● ○<br>40 80 120 160 | FINES CONTENT<br>(%)<br>◻<br>20 40 60 80<br>PLASTIC & LIQUID LIMIT<br>MOISTURE CONTENT<br>PL MC LL<br>20 40 60 80 |
|--------------|--------|---|-----------------------|---------|------|------------|---|--|---|
|              |        |   |                       | NUMBER  | TYPE | RECOVERY % |   |  |   |
| 1            |        | Organic Sandy Silt (Top Soil), black, moist, (soft)   |                       | S1      |      |            | 21  |  |   |
|              |        | Sand and Gravel (Fill), trace to some silt, brown, moist, (compact), gravel was sub-rounded | 0.1                   | S2      |      |            | 30  |  | 4   |
|              |        | Sand (Fill), some silt, trace gravel, brown, moist, (compact), sand was medium grained      | 0.4                   | S3      |      |            | 20  |  | 7   |
|              |        | Gravel (Fill), some sand, brown, moist, (compact), gravel was sub-angular                   | 1.0                   | S4      |      |            |   |  | 3   |
|              |        | Sand (Fill), some gravel, some silt, light brown with some red stains, (compact)            | 1.3                   | S5      |      |            |   |  | 13  |

Note: SPT N-values shown in the log are interpolated from encountered DCP N-values

Bottom of test pit at 1.4m.



EXP Services Inc  
3001 Wayburne Drive Unit 175A & Unit 275  
Burnaby, Colombie-Britannique V5G 4W3  
Telephone: 604-874-1245

# RECORD OF TEST PIT : TP19-02

PAGE 1 OF 1

PROJECT NUMBER VAN-00251326-A0

PROJECT NAME Proposed Modular Conunselling Building

EXCAVATION DATE 2019-01-30

EXCAVATION CONTRACTOR \_\_\_\_\_

EXCAVATION METHOD Hand Pit

EQUIPMENT TYPE Shovel

LOGGED BY JZ CHECKED BY PS

CLIENT University of British Columbia

PROJECT LOCATION 1874 East Mall, UBC Vancouver Campus

TEST PIT LOCATION ZONE: 10 N: 5457303.5 E: 481675.3

ELEVATION (approximate)

GROUND WATER DEPTHS: ☒ AT TIME OF EXCAVATION ---

☒ AT END OF EXCAVATION --- no groundwater encountered

☒ AFTER EXCAVATION ---

| DEPTH<br>(m) | STRATA | SOIL DESCRIPTION   | ELEV.<br>DEPTH<br>(m) | SAMPLES |      |            | SPT N VALUE<br>BLOWS/0.3m<br>▲<br>20 40 60 80<br>DYNAMIC CONE<br>BLOWS/0.3m<br>◻<br>20 40 60 80 | POCKET PEN.<br>(kPa)<br>●<br>100 200 300 400<br>FIELD VANE<br>SHEAR (kPa)<br>Peak Remold<br>● ○<br>40 80 120 160 | FINES CONTENT<br>(%)<br>□<br>20 40 60 80<br>PLASTIC & LIQUID LIMIT<br>MOISTURE CONTENT<br>PL MC LL<br>120 40 60 80 |
|--------------|--------|--|-----------------------|---------|------|------------|---|--|--|
|              |        |  |                       | NUMBER  | TYPE | RECOVERY % |   |  |  |
| 1            |        | Organic Sandy Silt, some gravel, dark brown, moist, (soft to firm)                     | 0.1                   | S1      |      |            | 19  |  |  |
|              |        | Sand (Fill), some silt, trace gravel, brown, moist, (compact), sand was medium grained |                       |         |      |            | 16  |  |  |
|              |        |  |                       | S2      |      |            | 16  |  | 7  |
|              |        |  |                       |         |      |            | 20  |  |  |
|              |        | Gravel (Fill), some sand, trace silt, brown, moist, (compact), gravel was sub-angular  | 1.2                   | S3      |      |            | 27  |  | 4  |
|              |        |  |                       |         |      |            | ▲ Per 150mm   |  |  |

Note: SPT N-values shown in the log are interperated from encountered DCP N-values

Bottom of test pit at 1.4m.



EXP Services Inc  
3001 Wayburne Drive Unit 175A & Unit 275  
Burnaby, Colombie-Britannique V5G 4W3  
Telephone: 604-874-1245

# RECORD OF TEST PIT : TP19-03

PAGE 1 OF 1

PROJECT NUMBER VAN-00251326-A0

PROJECT NAME Proposed Modular Counselling Building

EXCAVATION DATE 2019-01-30

EXCAVATION CONTRACTOR \_\_\_\_\_

EXCAVATION METHOD Hand Pit

EQUIPMENT TYPE Shovel

LOGGED BY JZ CHECKED BY PS

CLIENT University of British Columbia

PROJECT LOCATION 1874 East Mall, UBC Vancouver Campus

TEST PIT LOCATION ZONE: 10 N: 5457300.6 E: 481652.56

ELEVATION (approximate)

GROUND WATER DEPTHS: ☒ AT TIME OF EXCAVATION ---

☒ AT END OF EXCAVATION --- no groundwater encountered

☒ AFTER EXCAVATION ---

| DEPTH<br>(m)  | STRATA | SOIL DESCRIPTION  | ELEV.<br>DEPTH<br>(m) | SAMPLES |      |            | SPT N VALUE<br>BLOWS/0.3m<br>▲<br>20 40 60 80  | POCKET PEN.<br>(kPa)<br>⊙<br>100 200 300 400                     | FINES CONTENT<br>(%)<br>□<br>20 40 60 80                              |
|---|--------|---|-----------------------|---------|------|------------|--|--|---|
|   |        |   |                       | NUMBER  | TYPE | RECOVERY % | DYNAMIC CONE<br>BLOWS/0.3m<br>▣<br>20 40 60 80 | FIELD VANE<br>SHEAR (kPa)<br>Peak Remold<br>● ○<br>40 80 120 160 | PLASTIC & LIQUID LIMIT<br>MOISTURE CONTENT<br>PL MC LL<br>20 40 60 80 |
|   |        |   |                       |         |      |            |  |  |   |
| 1   |        | Gravel Surfaced   | 0.1                   | S1      |      | 13<br>▲    |  | 30<br>⬠  |   |
|   |        | Silty Sand (Fill), trace organic, black, moist, (compact)   |                       |         |      |            |  |  |   |
|   |        | Sand (Fill), some gravel to gravelly, brown, moist, (compact), sand was medium grained, gravel was sub-angular to sub-rounded<br><br>- increasing sand content with depth | 0.3                   | S2      |      | 29<br>▲    |  | 5<br>⬠   |   |
|   |        |   |                       |         |      | 30<br>▲    |  | 8<br>⬠   |   |
|   |        | 29<br>▲   |                       |         |      |            |  |  |   |
| Gravel (Fill), some sand to sandy, brown, moist, (compact), gravel was sub-rounded to rounded | 1.0    | S4  | ▲                     |         |      |            |  |  |   |

Note: SPT N-values shown in the log are interpolated from encountered DCP N-values

Bottom of test pit at 1.2m.



EXP Services Inc  
3001 Wayburne Drive Unit 175A & Unit 275  
Burnaby, Colombie-Britannique V5G 4W3  
Telephone: 604-874-1245

# RECORD OF TEST PIT : TP19-04

PAGE 1 OF 1

PROJECT NUMBER VAN-00251326-A0

PROJECT NAME Proposed Modular Conunselling Building

EXCAVATION DATE 2019-01-30

EXCAVATION CONTRACTOR \_\_\_\_\_

EXCAVATION METHOD Hand Pit

EQUIPMENT TYPE Shovel

LOGGED BY JZ CHECKED BY PS

CLIENT University of British Columbia

PROJECT LOCATION 1874 East Mall, UBC Vancouver Campus

TEST PIT LOCATION ZONE: 10 N: 5457289.8 E: 481658.9

ELEVATION (approximate)

GROUND WATER DEPTHS: ☒ AT TIME OF EXCAVATION ---

☒ AT END OF EXCAVATION --- no groundwater encountered

☒ AFTER EXCAVATION ---

| DEPTH<br>(m) | STRATA | SOIL DESCRIPTION  | ELEV.<br>DEPTH<br>(m) | SAMPLES |      |            | SPT N VALUE<br>BLOWS/0.3m<br>▲<br>20 40 60 80<br>DYNAMIC CONE<br>BLOWS/0.3m<br>◻<br>20 40 60 80 | POCKET PEN.<br>(kPa)<br>●<br>100 200 300 400<br>FIELD VANE<br>SHEAR (kPa)<br>Peak Remold<br>● ○<br>40 80 120 160 | FINES CONTENT<br>(%)<br>□<br>20 40 60 80<br>PLASTIC & LIQUID LIMIT<br>MOISTURE CONTENT<br>PL MC LL<br>20 40 60 80 |
|--------------|--------|---|-----------------------|---------|------|------------|---|--|---|
|              |        |   |                       | NUMBER  | TYPE | RECOVERY % |   |  |   |
| 1            |        | Silty Sand (Fill), some gravel, some organic, black, moist, (compact), gravel was rounded |                       | S1      |      |            |   |  |   |
|              |        | Sand (Fill), medium grained, brown, moist, (compact)                                      | 0.3                   | S2      |      |            |   |  | 30  |
|              |        | Sandy Gravel (Fill), brown, moist, (compact), gravel was sub-rounded                      | 0.9                   | S3      |      |            |   |  | 4   |

- Refusal to manual digging at 1.1 m below ground surface, very dense condition

Bottom of test pit at 1.1m.