March 23, 2015 Reference No. VAN-00213751-01

Musqueam Capital Corporation
6615 Salish Drive
Vancouver BC V6N 4C4

c/o Colliers International Consulting
19th Floor – 200 Granville Street
Vancouver, BC V6C 2R6 Email: gordon.easton@colliers.com

Attention: Gordon Easton, BA, M.E.S, MCIP

Re: Block F, Acadia and University Blvd., UBC
Acadia and Toronto Roads
Updated Preliminary Geotechnical Report

Dear Sir:

1.0 INTRODUCTION

As requested, **exp** Services Inc. (**exp**) has completed an updated preliminary geotechnical report for the above-noted site, including traffic and new utility inputs to geotechnical design.

The geotechnical work was performed in general accordance with **exp**'s proposal dated December 3, 2014. The purpose of the exploration was to provide a geotechnical report outlining the soil conditions encountered along the existing Acadia Road and Toronto Road, for road widening and utility upgrading design purposes.

Analysis of the soil or ground water with respect to environmental issues was beyond the scope of the geotechnical exploration. Appendix A contains our "Interpretation & Use of Study and Report" and forms an integral part of this report and must be included with any copies of this report.

2.0 PROPOSED DEVELOPMENTS AND SITE DESCRIPTION

The proposed site development would entail the following primary roadworks and servicing components along adjacent roadways, as follows:

a. Curb realignment for Toronto and Acadia Roads adjacent to the site; retain two lane roadways.
b. The upgrading of utilities (i.e. water, storm and sanitary) along Acadia Road, which will require excavation and restoration of roadway areas. The storm and sanitary depths vary from about 2m to 6m on Acadia Road.

Preliminary geotechnical design is provided for the above components. In addition, new roadways, Road A and Road B, will be required within the proposed development site. However, the interior roadways are currently inaccessible to equipment needed for geotechnical exploration, thus, conceptual design of interior roads is provided.

For road design purposes, the project specific traffic volumes and distributions and utility information were provided by others for geotechnical design purposes.

The proposed development site is located at the southwest corner of the intersection of University Blvd. and Toronto Road, near UBC in Vancouver, BC. The site is bounded by Acadia Road to the west, Toronto Road to the north, University Blvd. to the east, and residential development, a church plus U-Hill School to the south. The site is triangular-shaped, and it has dimensions of about 520m along Acadia Road and University Blvd., 60m along Toronto Road, and 290m along the south side of the site.

The topography generally slopes down very gently toward the north and east. The current site is heavily forested with a mix of deciduous and coniferous trees and medium to thick undergrowth.

The topography adjacent to the site generally slopes down very gently and away from the site perimeters. The site is generally bounded by residential and urban developments.

3.0 GEOTECHNICAL SUBSURFACE CHARACTERIZATIONS

3.1 Fieldwork and Laboratory Testing

The geotechnical exploration for this project was conducted on December 23, 2014. The exploration consisted of the following:

- Six (6) machine auger drill holes to depths of 1.5 to 3m below existing ground surface (designated AH14-01 to AH14-06, inclusive).
- One (1) Dynamic Cone Penetration Test (DCPT) at AH14-01.

The DCPT consisted of driving a blunt 60° steel cone (38mm long, 64mm diameter, with a sleeve 133mm long) at the end of the drill rods using a 140 lb. drop (automatic trip) hammer, falling 750mm to drive the top end of the drill steel rods. The number of blows required to drive the cone in 300mm increments is recorded and shown on the test hole logs. The auger test holes were completed to depths of 1.5 to 3m, with the DCPT stopped at a depth of about 2m, in till-like soil.

The geotechnical exploration was carried out under the supervision of a geotechnical representative from **exp**, who located the test holes, logged the subsurface conditions and gathered soil samples for further classification and laboratory testing. The laboratory tests included natural moisture content on selected soil samples and two sieve tests. The test holes were backfilled with the drill cuttings upon completion.

The approximate test hole locations are shown on the attached Test Hole Location Plan, Figure 1 in Appendix B. Soil descriptions of each test pit including the moisture content test results are included in the test hole logs in Appendix C. The sieve analysis reports are shown in Appendix D.

3.2 Soil and Groundwater Conditions

The available test holes and nearby records generally encountered the following soil types:

UNIT FR	**FILL – SAND and GRAVEL**
	- Trace to some silt - Subangular particles, except in AH14-06 (Toronto Road) - Moisture contents 3 to 6%
UNIT F1	**FILL – SAND to SILT and SAND**
	- Encountered at 0.6 to 1.1m depth in AH14-03 - Encountered at 0.3 to 1.1m depth in AH14-04 - Moisture contents: 18 to 33%
UNIT A	**SAND, some silt**
	- Trace to some silt, trace to some gravel - Loose to compact - 0.7 to 1.5m thick in test holes - Moisture contents: 10 to 33%
UNIT B	**TILL-LIKE (SAND and SILT) SOILS**
	- Dense - Some gravel - Encountered at 1.6 to 1.8m depths in the test holes, except 0.3m depth in AH14-06

Groundwater

At the time of the drilling, slight groundwater seepage was encountered at depths of 0.8 to 1.5m, in two of six test holes (AH14-01 and AH14-02). The groundwater seepage is interpreted to be perched groundwater near the till-like soil surface. The perched water level may vary and fluctuate seasonally and in response to climatic conditions and local land use. Based on file information, the regional water table is anticipated to be at great depth in the order of about 60m below grade, at the bottom of the Quadra Sand.

It should be noted that the above subsurface conditions were encountered at the test hole locations only. The actual soil and groundwater conditions may vary between the test holes.

4.0 PRELIMINARY EVALUATION AND ANALYSIS

4.1 General

It is anticipated that proposed pavement areas along Acadia and Toronto Roads will generally be underlain by either one of the following:

- Existing roadway embankment, including sand and gravel fill and sand and silt fill, Unit F soils;
- Natural Sand soils, e.g. Unit A Sand.
- Dense silt and sand till-like soil, e.g. AH14-06 on Toronto Road.

The conditions within proposed widening areas are inferred based on site observations, testhole records, etc. The available exploration records provide information for the preliminary geotechnical design and the proposed roadway and utility upgrade purposes. Additional exploration is recommended for final design purposes for Road A and Road B due to lack of access at this time.

4.2 Pavement Design Criteria/Methodology

Pavement design has been conducted in accordance with standard practices including the AASHTO's Guide for Design of Pavement Structures (1993). Structural coefficients, drainage coefficients, and material properties for pavement construction materials have been based on exploration data evaluation and local practices. For design purposes, good drainage of the roadbed has been assumed.

The design criteria and input parameters utilized for pavement design included 20 year design life and good performance expectation. Industry practice within nearby jurisdictions was also considered.

4.3 Existing Materials

The testholes on Acadia Road encountered 75mm thick asphalt surfacing material, typically. The asphalt was 90mm thick in the one testhole on Toronto Road.

The testholes on Acadia Road encountered sand and gravel fill, subangular materials over native sand or sand fill, and in one testhole, sand and silt fill. The sand and gravel thickness varied from typically about 0.23m to 0.5m and 0.7m in two of five test holes. The sieve analysis report (Appendix D) done on sand and gravel fill show gradations compatible with MMCD Granular Base material gradation. Visually, the sand and gravel fill gravel particles were classified as sub-angular.

The test hole on Toronto Road encountered the sand and gravel fill, over dense silt and sand (till-like soil). The fill in the test hole on Toronto Road differed from that on Acadia, in that it was comprised of rounded particles.

At the time of the fieldwork, visual reconnaissance of existing pavements indicated the following:

- Numerous transverse cracks, occasional longitudinal cracks.
- Crack sealing.
- Occasional alligator cracked areas.
- Some wheel path rutting areas.

The pavement generally was in fair condition, with some localized poor condition areas.

4.4 Subgrade Resilient Modulus and ESAL's

As previously mentioned, governing subgrade is considered to consist of sand fill or silty sand. In consideration of these subgrade conditions, our past experience on other similar projects and empirical correlations, we have considered a representative subgrade resilient modulus to be M_r = 30 MPa for compacted silty sand subgrade for pavement design purposes.

The Bunt & Associates traffic study provided inputs to pavement design. Key considerations include 600 vehicles per peak hour (two way) and traffic distribution analyses, plus essentially nominal or little traffic growth over a 20 year design life.

Based on traffic information including 2% trucks provided by Bunt & Associates, we have determined a 20 year design ESAL value as follows:

Acadia, Toronto and Road A: ESAL's = 1,000,000

A somewhat lesser ESAL value would apply at Road B, as less truck traffic is anticipated.

4.5 Source Materials and Disposal

It is understood that granular materials could be available as follows:

- Granular fill from industry sources located in the vicinity of the site.
- Re-use of select materials, i.e., Sand and Gravel Fill, Unit FR, and pulverized pavements.

It is anticipated that significant stripping quantities may be placed outside the roadways, and on the proposed development site, provided materials can meet criteria for landscape fill purposes. Otherwise, suitable off-site disposal may be anticipated.

5.0 PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

5.1 General

The exploration testholes generally encountered granular fills over sand and some silt underlain by dense silt and sand, till-like soil at depth. Groundwater seepage was encountered in some of the test holes, however the water table may fluctuate due to the river levels and a seasonal, shallow perched water table may be anticipated where surficial water infiltration is “perched” on top of silty horizons.

Based on available information, construction of the proposed utility upgrades and pavements by conventional methods appears feasible.

5.2 Seismic Design Considerations

Based on the subsurface profile as mentioned above, the average properties of the top 30m are consistent with dense soils, which are considered to be generally non-liquefiable during the design earthquake events of the 2012 BCBC. As such, liquefaction induced ground displacement is expected to be minimal.

5.3 Utilities

Installation of the proposed utilities, such as, water and sewer lines, are anticipated on Acadia Road, and also on the proposed Roads A and B. The Binnie & Associates drawings show utilities including 250 diameter sewer lines at depths of 2 to 6m (storm, sanitary) and, 300 diameter water lines. The three utilities will be spaced 2 to 3m apart on a significant portion of Acadia Road, and as such existing pavements will be disturbed by excavations.

Post-construction trench fill settlements may be anticipated in range of 20 mm to 30mm, depending on backfill materials and construction details.

5.3.1 Excavation

The composition and consistency of the soils at the site are such that suitably equipped hydraulic excavators should be able to dig these materials.

The sidewalls of unsupported trench excavations should generally be cut vertical to about 1m depth and no steeper than 1H:1V (horizontal:vertical) below 1m depth. However, flatter cut slope gradients may be required for trench stability and worker safety purposes, if loose soils are prone to caving and sloughing or where significant zones of groundwater seepage are encountered. A Geotechnical Engineer should review the soils encountered periodically during excavation and to recommend flatter slopes, if required.

If open cut slopes are considered impractical or undesirable (e.g., depths greater than 1.2m), appropriate trench shoring/bracing methods should be employed such as standard trench boxes and/or sheeting, meeting the requirements of WorkSafeBC and other applicable authorities. The temporary shoring system should be the responsibility of the contractor, as per WorkSafeBC requirement including temporary works engineering.

As previously noted, perched water may be encountered. As such, some groundwater seepage should be assumed in the proposed trench excavation, and dewatering should be completed as necessary to allow pipe installation and backfill placement to occur in dry conditions. Based on the subsurface conditions encountered and local experience, it is probable that conventional sump pumping methods would be sufficient to handle possible seepage volumes. However, the dewatering method used would need to be selected in response to actual groundwater conditions encountered during construction. The design, operation, and maintenance of a dewatering system should be the responsibility of the contractor.

5.3.2 Pipe Subgrade and Bedding

The loose to compact sand or dense, till-like soil are the anticipated subgrades for pipe bedding. Unsuitable soil such as organic rich materials should be removed to expose anticipated subgrade.

Pipe bedding should be provided, consistent with Master Municipal Construction Documents (MMCD) Standards.

5.3.3 Trench Backfill

Backfilling of the utility trenches should be in general accordance with Master Municipal Construction Documents (MMCD) Section 02223 requirement and applicable Standard Specifications for the trench backfill.

Imported granular backfill should be comprised of free-draining, well graded sand and gravel meeting gradation specifications for either “100mm minus Pit Run Gravel” or “Select Granular Subbase” per MMCD Section 02226 Items 2.3 and 2.8. A “River Sand” per MMCD Section 02226 Item 2.5 except maximum 3% passing 0.075mm sieve is considered acceptable granular backfill below 1.5m depths. The materials quality testing should include a full “sieve stack”, include 0.6, 0.3, 0.15, and 0.75mm sieves and the particle distributions would have to meet criteria defined by straight lines between sieve sizes shown for MMCD materials. The granular backfill should be placed in maximum 200 to 300mm lifts, with each lift compacted to achieve at least 95% Modified Proctor maximum dry density (ASTM D 1557). Below depth of 2.5m, backfill should be compacted to at least 93% Modified Proctor maximum dry density.

The existing native soils, comprised of sand and till-like soil, are considered unsuitable for re-use as granular backfill. However, feasibility of reuse may be considered at the time of construction, if materials handling meet acceptance criteria for backfills.

5.4 Pavement Design Recommendations

5.4.1 Pavement Structure

The results of the new pavement structure design, incorporating the assumption and design parameters outlined above, are summarized in Tables 1 and 2 below. Note that detailed design for Road B (Table 2) may consider a reduced subbase thickness, depending on details of subgrade and embankment materials anticipated.

Table 1.
Pavement Structure for (Minor Collector) Acadia Road, Toronto Road and Road A

Assumed Subgrade	Pavement Structure	
	Material Type	Thickness
Embankment Fill, Compact Sand and dense Silt and Sand	Asphalt Pavement	100mm
	19mm Granular Base	100mm
	19mm minus Granular Base or 75mm Crushed Granular Subbase	350mm
	Total Thickness:	**550mm**

Table 2.
Pavement Structure for Road B (Local Street)

Assumed Subgrade	Pavement Structure	
	Material Type	Thickness
Embankment Fill, Compact Sand and dense Silt and Sand	Asphalt Pavement	80mm
	19mm Granular Base	100mm
	19mm minus Granular Base or 75mm Crushed Granular Subbase	350mm
	Total Thickness:	**530mm**

The Hot Mix Asphalt surfacing should be placed in two equally thick lifts using MMCD Lower Course #1 for the bottom lift and Upper Course #1 for the top lift as per MMCD Section 02512. A tack cost should be applied between the lifts as per MMCD Section 02547. Superpave asphalt surfacing may be considered for heavy traffic areas, e.g. bus lanes, to provide improved rut resistance.

At new construction tie-ins to existing pavement, a sawcut joint should be planned to coincide within 150mm either side of the new lane edge or centre of the lane to avoid a construction joint along a wheelpath which can lead to raveling and joint failure. Along Acadia Road, top lift paving could be postponed by a year to minimize trench fill settlement effects on the finished road surface.

5.4.2 Pavement Construction Materials, Placement and Construction

Gradations of the surficial 19mm minus Granular Base and the underlying Crushed Granular Subbase should be in compliance with MMCD. The base and subbase material should be compacted to at least 95% Modified proctor maximum dry density. The existing sand and gravel, Unit FR, material may be reused as subbase material.

Materials required to reinstate grade under the above-noted surfacing structure should be comprised of Select Granular Subbase (SGSB) or equivalent.

5.4.3 Estimated Stripping Depths

It is estimated that stripping depths may be in the order of about 0.1 to 0.3m to remove topsoils. Some additional excavation or stripping may be required to accommodate pavement sections.

5.4.4 Roadway Excavation and Drainage

It is estimated that it would be practical to use conventional excavation equipment to excavate soils encountered in testholes at the site. Based upon the testhole results, it is considered that excavations could be kept free of standing water using conventional pumping from sumps to facilitate excavation.

5.4.5 Existing Pavements

It is anticipated that the existing pavement section would be deficient for purposes of the traffic anticipated with the proposed site development. It is judged that asphalt overlay on the existing pavement would fail to achieve pavement design criteria. The repair of fair to poor pavement areas required for overlay purposes likely makes an overlay option impractical and costly.

6.0 GEOTECHNICAL REVIEWS, FURTHER STUDY

It is anticipated that plans for utilities and pavement would be reviewed by the Geotechnical Engineer prior to final design. Project specific recommendations may be anticipated.

Additional exploration is recommended within the proposed site for utility and road design (Road A and B) and construction purposes.

7.0 CLOSURE

Exp Services Inc. has prepared this report based on referenced information and our understanding of the project as described in this report.

The report was prepared for the exclusive use of our client, Musqueam Capital Corporation and their designated consultants and agents, and may not be used by other parties without the written consent of **exp** Services Inc.

We trust that this report will meet your present requirements. Please contact the undersigned should you have any questions or require further assistance.

Sincerely,

exp Services Inc.

Don Sargent, P.Eng.
Senior Engineer

Reviewed by:

Ben Weiss, P.Eng.
Senior Engineer

Enclosures: Appendix A – Interpretation & Use of Study and Report
Appendix B – Test Hole Location Plan
Appendix C – Test Hole Logs
Appendix D – Sieve Test Reports

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Appendix A

Interpretation & Use of Study and Report

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.

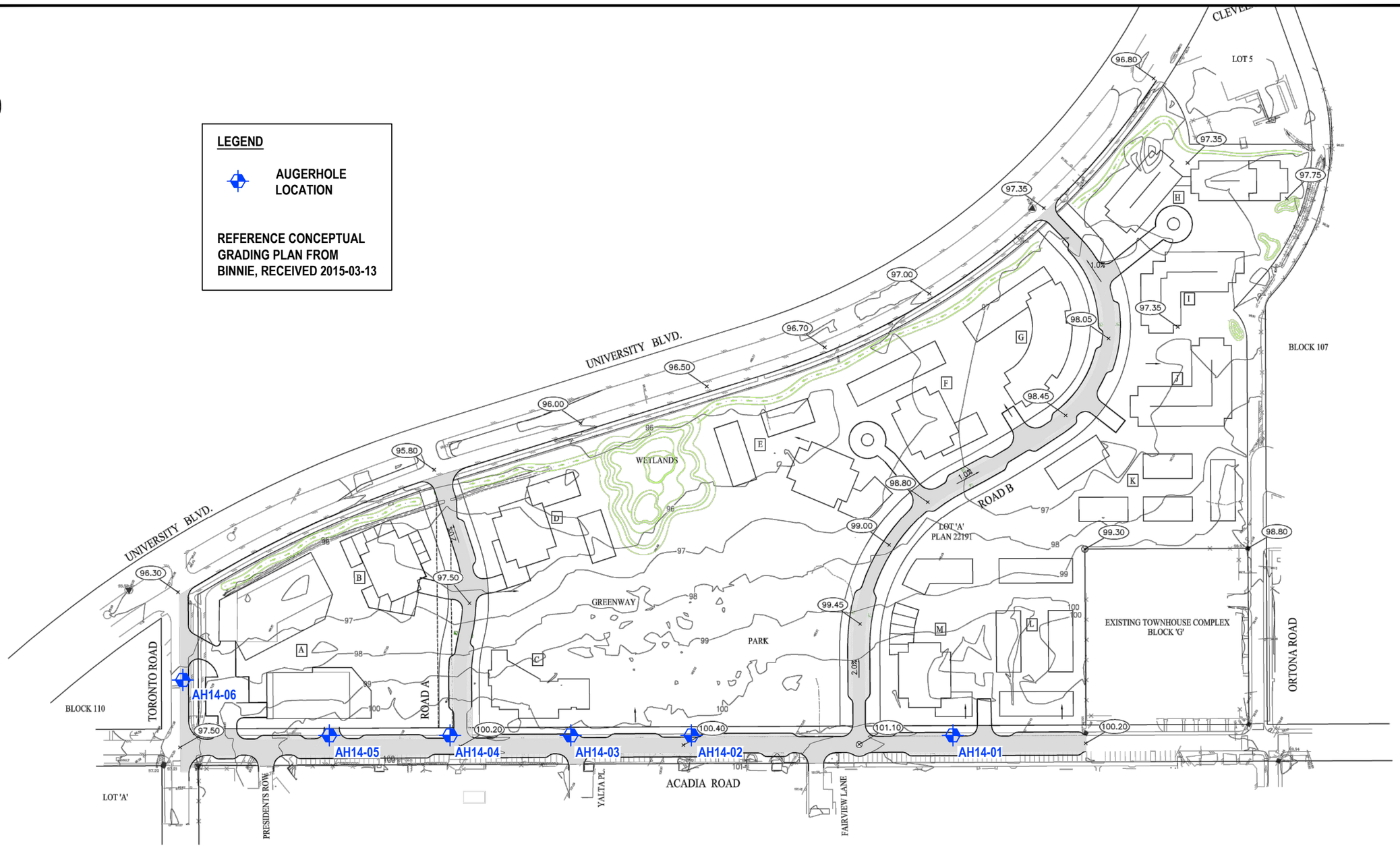
Appendix B

Test Hole Location Plan

LEGEND

AUGERHOLE LOCATION

REFERENCE CONCEPTUAL GRADING PLAN FROM BINNIE, RECEIVED 2015-03-13



0 1:2000 100

exp Services Inc. 275–3001 Wayburne Drive Burnaby, British Columbia V5G 4W3 Telephone: 604–874–1245 Fax: 604–874–2358 exp.com	DFTR. MG DSGN. CHK. DWS	REVISIONS No. / DESCRIPTION / DATE	CLIENT: Musqueam Capital Corp. c/o Colliers International PROJECT: Acadia and Toronto Roads - Geotechnical Block F, Acadia Road and University Blvd., UBC PROJECT NO.: VAN-00213751-01	TITLE: TESTHOLE LOCATION PLAN DATE: 2015-01-19 SCALE: 1:2000 DWG NO.: FIGURE 1	

Mar 16, 2015 - 4:19pm L:\2013 (starting at 0210575-A01)\0213751-01 DWS Block F, Acadia & University Blvd, UBC\50. Project Inputs\50. Internal\Cad\213751-01 Testhole Plan rev1.dwg

Appendix C

Test Hole Logs

AH14-01o AH14-06, inclusive

RECORD OF AUGERHOLE : AH14-01

exp Services Inc

CLIENT Musqueam Capital Corp. c/o Colliers International
PROJECT NUMBER VAN-0213751-01
DRILLING DATE 2014-12-23 to 2014-12-23
DRILLING CONTRACTOR On Track Drilling Inc.
DRILLING METHOD Solid Stem Auger
LOGGED BY SCD **CHECKED BY** DWS

PROJECT NAME Acadia and Toronto Roads - Geotechnical
PROJECT LOCATION Block F, Acadia Road and University Blvd., UBC
AUGERHOLE LOCATION ZONE:10 N: 5456707 E: 482875
ELEVATION
GROUND WATER LEVELS: ▽ **AT TIME OF DRILLING** 0.8m
▼ **AFTER DRILLING** ---

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY %	SPT N VALUE BLOWS/0.3m ▲ / DYNAMIC CONE BLOWS/0.3m	FINES CONTENT (%) □ / PLASTIC & LIQUID LIMIT MOISTURE CONTENT PL MC LL
		ASPHALT (75mm)						
		SAND AND GRAVEL, trace silt, grey, moist, gravel is sub-angular, (compact), (FILL)	0.1	S01			DRILLOUT; 28; 15	6
1		SAND, some silt, trace gravel, brown, wet, (loose)	0.8	S02			6; 1; 2; 37	16; 14
2		SILTY SAND, trace gravel, light grey, wet, (dense), (TILL-LIKE)	1.8	S03				
				S04				14
3								

Bottom of hole at 3.0m.

RECORD OF AUGERHOLE : AH14-02

exp Services Inc

CLIENT Musqueam Capital Corp. c/o Colliers International
PROJECT NUMBER VAN-0213751-01
DRILLING DATE 2014-12-23 to 2014-12-23
DRILLING CONTRACTOR On Track Drilling Inc.
DRILLING METHOD Solid Stem Auger
LOGGED BY SCD **CHECKED BY** DWS

PROJECT NAME Acadia and Toronto Roads - Geotechnical
PROJECT LOCATION Block F, Acadia Road and University Blvd., UBC
AUGERHOLE LOCATION ZONE:10 N: 5456796 E: 482829
ELEVATION
GROUND WATER LEVELS: ▽ **AT TIME OF DRILLING** ---
▼ **AFTER DRILLING** ---

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY %	SPT N VALUE BLOWS/0.3m ▲ / DYNAMIC CONE BLOWS/0.3m	FINES CONTENT (%) □ / PLASTIC & LIQUID LIMIT MOISTURE CONTENT PL MC LL
		ASPHALT (70mm)						
		SAND AND GRAVEL, trace silt, moist, grey, (compact), gravel is sub-angular, (FILL)	0.1	S05				5
		SAND, trace silt, brown, moist, (loose)	0.3	S06				10
1		SAND, some gravel, trace silt, grey, brown, moist, (loose)	0.8	S07				11
2		SILT AND SAND, trace gravel, light grey, wet, (dense), (TILL-LIKE)	1.8	S08				12
3				S09				13

Bottom of hole at 3.0m.

RECORD OF AUGERHOLE : AH14-03

exp Services Inc

CLIENT Musqueam Capital Corp. c/o Colliers International
PROJECT NUMBER VAN-0213751-01
DRILLING DATE 2014-12-23 to 2014-12-23
DRILLING CONTRACTOR On Track Drilling Inc.
DRILLING METHOD Solid Stem Auger
LOGGED BY SCD **CHECKED BY** DWS

PROJECT NAME Acadia and Toronto Roads - Geotechnical
PROJECT LOCATION Block F, Acadia Road and University Blvd., UBC
AUGERHOLE LOCATION ZONE:10 N: 5456875 E: 482786
ELEVATION
GROUND WATER LEVELS: ▽ **AT TIME OF DRILLING** 1.2m
▼ **AFTER DRILLING** ---

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY %	SPT N VALUE BLOWS/0.3m ▲ / DYNAMIC CONE BLOWS/0.3m	FINES CONTENT (%) □ / PLASTIC & LIQUID LIMIT MOISTURE CONTENT PL MC LL
		ASPHALT (75mm)						
		SAND AND GRAVEL, grey, moist, (compact), gravel is sub-angular, (FILL)	0.1	S10				3
		SAND AND SILT, some gravel, grey, moist, (loose), (FILL)	0.6	S11				18
1		SAND, some silt, trace organics, dark brown, moist, (firm)	1.1	S12				46
		▽ SAND, some silt, trace gravel, brown, wet, (loose)	1.2	S13				27
		SILTY SAND, trace gravel, grey, moist, (dense), (TILL-LIKE)	1.7	S14				19
2								
				S15				13
3								

Bottom of hole at 3.0m.

RECORD OF AUGERHOLE : AH14-04

exp Services Inc

CLIENT Musqueam Capital Corp. c/o Colliers International
PROJECT NUMBER VAN-0213751-01
DRILLING DATE 2014-12-23 to 2014-12-23
DRILLING CONTRACTOR On Track Drilling Inc.
DRILLING METHOD Solid Stem Auger
LOGGED BY SCD **CHECKED BY** DWS

PROJECT NAME Acadia and Toronto Roads - Geotechnical
PROJECT LOCATION Block F, Acadia Road and University Blvd., UBC
AUGERHOLE LOCATION ZONE:10 N: 5456928 E: 482758
ELEVATION
GROUND WATER LEVELS: ▽ **AT TIME OF DRILLING** ---
▼ **AFTER DRILLING** ---

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY %	SPT N VALUE BLOWS/0.3m ▲ / DYNAMIC CONE BLOWS/0.3m	FINES CONTENT (%) □ / PLASTIC & LIQUID LIMIT MOISTURE CONTENT PL MC LL
		ASPHALT (75mm)						
		SAND AND GRAVEL, grey, moist, (compact), gravel is sub-angular, (FILL)	0.1	S16				4
		SAND, some silt, mixed brown and dark brown pockets, moist, (compact), (FILL)	0.3	S17				33
1		SAND, some silt, brown, moist, (compact)	1.1	S18				27
2		SILT AND SAND, trace gravel, grey, moist, (dense), (TILL-LIKE)	1.8	S19				17
3				S20				9

Bottom of hole at 3.0m.

RECORD OF AUGERHOLE : AH14-05

exp Services Inc

CLIENT Musqueam Capital Corp. c/o Colliers International
PROJECT NUMBER VAN-0213751-01
DRILLING DATE 2014-12-23 to 2014-12-23
DRILLING CONTRACTOR On Track Drilling Inc.
DRILLING METHOD Solid Stem Auger
LOGGED BY SCD **CHECKED BY** DWS

PROJECT NAME Acadia and Toronto Roads - Geotechnical
PROJECT LOCATION Block F, Acadia Road and University Blvd., UBC
AUGERHOLE LOCATION ZONE:10 N: 5456980 E: 482729
ELEVATION
GROUND WATER LEVELS: ▽ **AT TIME OF DRILLING** 1.5m
▼ **AFTER DRILLING** ---

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY %	SPT N VALUE BLOWS/0.3m ▲ / DYNAMIC CONE BLOWS/0.3m	FINES CONTENT (%) □ / PLASTIC & LIQUID LIMIT MOISTURE CONTENT PL MC LL
		ASPHALT (75mm)						
		SAND AND GRAVEL, trace silt, grey, moist, (compact), gravel is sub-angular, (FILL)	0.1	S21				6
		SAND, trace gravel, some silt, brown, moist, (compact)	0.3	S22				14
1		SAND, trace gravel, trace silt, brown, moist, (compact) ▽	0.8	S23				8
2		SILTY SAND, trace gravel, grey, moist, (dense)	1.8	S24				10
3		SANDY SILT, trace gravel, grey, moist, (dense), (TILL-LIKE)	2.1	S25				17
		Bottom of hole at 3.0m.						

RECORD OF AUGERHOLE : AH14-06

exp Services Inc

CLIENT Musqueam Capital Corp. c/o Colliers International
PROJECT NUMBER VAN-0213751-01
DRILLING DATE 2014-12-23 to 2014-12-23
DRILLING CONTRACTOR On Track Drilling Inc.
DRILLING METHOD Solid Stem Auger
LOGGED BY SCD **CHECKED BY** DWS

PROJECT NAME Acadia and Toronto Roads - Geotechnical
PROJECT LOCATION Block F, Acadia Road and University Blvd., UBC
AUGERHOLE LOCATION ZONE:10 N: 5457059 E: 482723
ELEVATION
GROUND WATER LEVELS: ▽ **AT TIME OF DRILLING** ---
▼ **AFTER DRILLING** ---

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY %	SPT N VALUE BLOWS/0.3m ▲ 20 40 60 80 / DYNAMIC CONE BLOWS/0.3m 20 40 60 80	FINES CONTENT (%) □ 20 40 60 80 / PLASTIC & LIQUID LIMIT MOISTURE CONTENT PL MC LL 20 40 60 80
		ASPHALT (90mm)						
		SAND AND GRAVEL, trace silt, grey, moist, (compact), gravel is rounded, (FILL)	0.1	S26				3
		SILT AND SAND, trace gravel, grey, dry, (dense), (TILL-LIKE)	0.3	S27				7
1				S28				7

-Refusal at 1.5m

Bottom of hole at 1.5m.

Appendix D

Sieve Test Reports

No. 1 to 2

exp Services Inc.
275-3001 Wayburne Drive
Burnaby, BC V5G 4W3
604-874-1245

Kamloops Branch
250-372-5321

CERTIFIED TESTING LABORATORY

SIEVE ANALYSIS REPORT
8 16 30 50 SERIES

PROJECT NO. 002-13751
CLIENT MUSQUEAM CAPITAL CORP.
C.C. exp - DON SARGENT

TO
MUSQUEAM CAPITAL CORP.
6615 SALISH DRIVE
VANCOUVER, BC
V6N 4C4

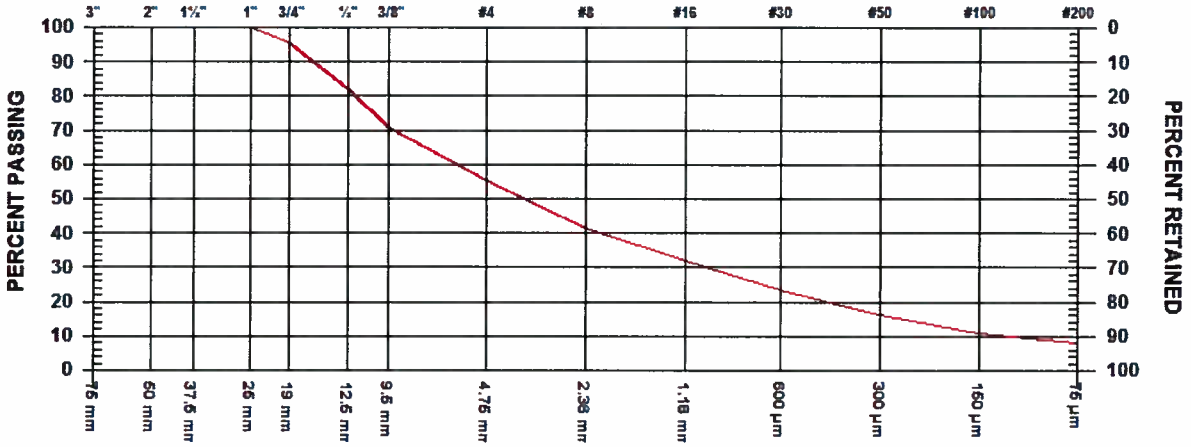
ATTN: MR. JIM ROSS

PROJECT BLOCK F, ACADIA & UNIVERSITY BLVD. UBC
GEOTECHNICAL VANCOUVER
CONTRACTOR

SIEVE TEST NO. 1 DATE RECEIVED Jan 19,2015 DATE TESTED Jan 19,2015 DATE SAMPLED Dec 23,2014

SUPPLIER SITE - DRILLING
SOURCE S1 & S5 COMBINED SAMPLE
SPECIFICATION
MATERIAL TYPE SAND AND GRAVEL, TRACE SILT

SAMPLED BY S. DALY
TESTED BY H. WU
TEST METHOD WASHED



GRAVEL SIZES		PERCENT PASSING	GRADATION LIMITS
3"	75 mm		
2"	50 mm		
1 1/2"	37.5 mm		
1"	25 mm	100.0	
3/4"	19 mm	95.3	
1/2"	12.5 mm	82.0	
3/8"	9.5 mm	70.9	

SAND SIZES AND FINES		PERCENT PASSING	GRADATION LIMITS
No. 4	4.75 mm	55.2	
No. 8	2.36 mm	41.5	
No. 16	1.18 mm	32.1	
No. 30	600 µm	23.5	
No. 50	300 µm	16.3	
No. 100	150 µm	10.9	
No. 200	75 µm	8.1	

COMMENTS
TEST METHOD: ASTM C136, C117.

Jan 20,2015 exp Services Inc. BRIAN GRAY, AScT PER.

exp Services Inc.
275-3001 Wayburne Drive
Burnaby, BC V5G 4W3
604-874-1245

Kamloops Branch
250-372-5321

CERTIFIED TESTING LABORATORY

SIEVE ANALYSIS REPORT
8 16 30 50 SERIES

PROJECT NO. 002-13751
CLIENT MUSQUEAM CAPITAL CORP.
C.C. exp - DON SARGENT

TO
MUSQUEAM CAPITAL CORP.
6615 SALISH DRIVE
VANCOUVER, BC
V6N 4C4

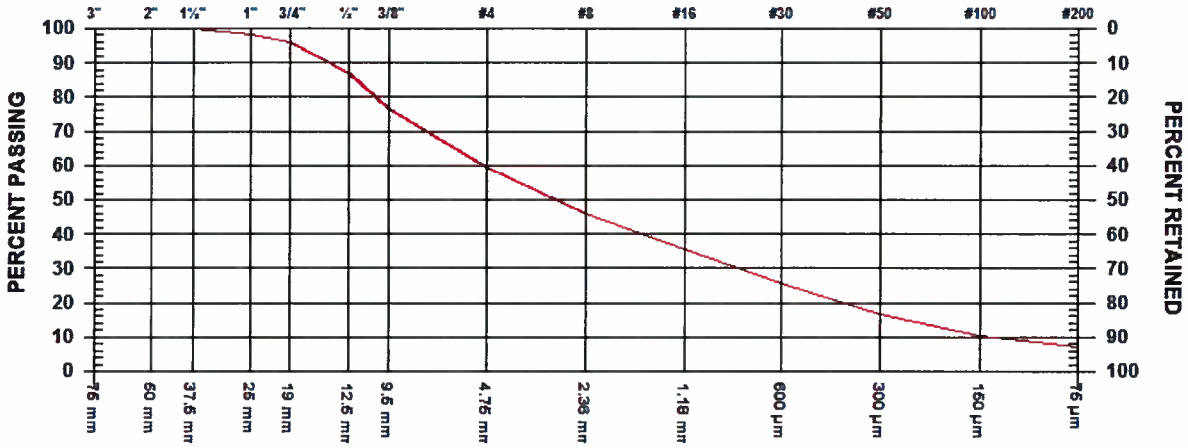
ATTN: MR. JIM ROSS

PROJECT BLOCK F, ACADIA & UNIVERSITY BLVD. UBC
GEOTECHNICAL VANCOUVER
CONTRACTOR

SIEVE TEST NO. 2 DATE RECEIVED Jan 19,2015 DATE TESTED Jan 19,2015 DATE SAMPLED Dec 23,2014

SUPPLIER SITE - DRILLING
SOURCE S16, S21, S10 COMBINED SAMPLE
SPECIFICATION
MATERIAL TYPE SAND AND GRAVEL, TRACE SILT

SAMPLED BY S. DALY
TESTED BY H. WU
TEST METHOD WASHED



GRAVEL SIZES		PERCENT PASSING	GRADATION LIMITS
3"	75 mm		
2"	50 mm		
1 1/2"	37.5 mm	100.0	
1"	25 mm	98.2	
3/4"	19 mm	95.9	
1/2"	12.5 mm	86.8	
3/8"	9.5 mm	76.6	

SAND SIZES AND FINES		PERCENT PASSING	GRADATION LIMITS
No. 4	4.75 mm	59.6	
No. 8	2.36 mm	46.1	
No. 16	1.18 mm	35.4	
No. 30	600 µm	25.5	
No. 50	300 µm	16.6	
No. 100	150 µm	10.2	
No. 200	75 µm	7.4	

COMMENTS
TEST METHOD: ASTM C136, C117.

 Jan 20,2015 exp Services Inc. BRIAN GRAY, AScT PER.