

Icona Properties  
#900 – 1111 West Hastings Street  
Vancouver, BC  
V6E 2J3

November 15, 2023  
File: 21741  
R0

Attention: Adelana Gilpin Jackson

**Re: Geotechnical Investigation Report – Proposed Community Development  
Anmore South – Sunnyside Road and First Avenue, Anmore, BC**

## **1.0 INTRODUCTION**

We understand that Icona Properties are considering the above referenced site for development. Concept drawings provided to us indicate that the proposed development could consist of multi-family dwellings, mixed-use buildings, community centres as well as parks and other natural protected areas. We further understand that the majority of the new buildings would be constructed at-grade while some of the multi-family and mixed-use structures may include 2-3 levels of below grade parking. We anticipate that some grading in the form of cut and fill would be required to achieve the desired grades for the proposed new roads and at grade homes. Excavation requirements for the contemplated underground parkade levels should be reviewed once the design has progressed.

This report presents the results of our geotechnical investigation and makes preliminary recommendations for the design and construction of the new development. This report has been prepared exclusively for our client, for their use, the use of others on their design team, and for submission to the Village of Anmore during the development and permitting process.

## **2.0 SITE DESCRIPTION**

The site is located to the east of the intersection of Sunnyside Road and First Avenue in Anmore, BC. The site is bounded by First Avenue to the west, existing single-family homes to the north and east, the municipal boundary of Port Moody to the south and is roughly bisected by Sunnyside Road. The site slopes from approximately 135 m geodetic at the northeast side of the site to 35 m geodetic at the southwest site of the site, over a horizontal distance of approximately 1,000 m. (ViewPort, 2022). We also understand that some watercourses and tributaries exist within the development area.

The site location relative to the surrounding area is shown on our Drawing No. 21741-01 following the text of this report.

## **3.0 FIELD INVESTIGATION**

GeoPacific supervised a drill investigation at the site on October 19<sup>th</sup> and 20<sup>th</sup>, 2023. At that time, thirteen boreholes were advanced to depths of up to 9.1 m below existing site grades. Eight of the boreholes were supplemented with a Dynamic Cone Penetration Test (DCPT) soundings to estimate the in-situ relative density of the upper soil profile. Four of the boreholes were completed as groundwater monitoring wells to aid in characterizing the hydrological conditions at the site. The drilling was completed using a track mounted auger drill rig supplied and operated by Southland Drilling of Delta, BC.

GeoPacifc have also been provided with supplementary borehole information prepared by others for the site. The provided logs are based on an investigation undertaken on September 15, 2019. At that time, 5 boreholes were advanced to depths of up to 5.5 m below existing grades using an auger drill rig.

Our soil logs as well as the provided reference soil logs are presented in Appendix A. The approximate location of our test holes are shown on our Drawing 21741-01 and the location of the provided boreholes are shown on Drawing 21741-02, each attached following the text of this report.

## **4.0 SUBSURFACE CONDITIONS**

### **4.1 Soil Conditions**

Based on the Geological Survey of Canada Map 1484A – Surficial Geology New Westminster, the site is described as being underlain by Capilano Sediments and Vashon Drift glacial till. The Capilano Sediments are described as raised marine beach, spit, bar and lag vaneer, poorly sorted sand to gravel normally less than 1 m thick but up to 8 m thick. The Vashon Drift generally consists of lodgement and minor flow till, lenses and interbeds of glaciolacustrine laminated stony silt.

A general description of the soils encountered during our drill investigation are as follows:

#### **FORREST LITTER / TOPSOIL**

Each of our boreholes was completed in a location with up to 0.8 m of topsoil and forest litter present at surface. The surficial soils were noted to contain some organics, varying amounts of sand and be brown and moist to wet.

#### **SILT to SANDY SILT (Post Glacial)**

At TH23-01, -02, -03 and -11, a layer of silty soil was observed below the topsoil and was noted to extend down to depths of up to 1.4 m below existing site grades. The silt to sandy silt was observed to vary in relative density from soft to very stiff.

#### **SAND to SAND and GRAVEL (Post Glacial)**

Granular post glacial soils were observed at TH23-06, TH23-10 and TH23-12 directly below the topsoil. The composition of the sand dominant soils varies from sand to sand and gravel to silty sand. The sandy post glacial soils were noted to be dense to very dense and were observed to extend down to depths of up to 2.4 m below existing site grades.

#### **SAND and SILT (Glacial Till)**

Glacial till was observed at all test holes at depths ranging from near surface to 2.4 m below existing site grades. DCPT refusal occurred at or near the top of the glacial till contact indicating that it is very dense. The glacial till is generally comprised of mixtures of silt, sand and gravel in varying proportions and is grey, and dry to moist. Drill refusal occurred within the glacial till soils at several test holes which suggests that boulders may be present within the glacial till.

The soil conditions noted at our test hole locations are generally consistent with the provided logs as well as the published geology for the area. Please refer to the borehole logs included in Appendix A for more details.

## 4.2 Groundwater Conditions

According to the BC Water Resources Atlas, the southeast portion of the site is within the mapped extent of Aquifer #924. The Atlas states that the Aquifer #924 is comprised of confined glaciofluvial sand and gravel underneath glacial till.

The nearest registered well to the site, within the mapped extent of Aquifer #924 has Well Tag Number (WTN) 74082. It is located at 2130 Sunny Side Road, directly adjacent to the southeast corner of the subject site. There are no detailed soil logs presented on the Atlas, however, the static groundwater level is shown to be approximately 27.4 m below ground surface. The groundwater level reported at WTN 74082 is well below the likely founding elevation of any underground levels as well as below the depth of the cut and fill anticipated as part of the site preparation work. Thus, we expect that the proposed development will not encounter the static groundwater table.

The provided borehole logs included monitoring well installations within the glacial soils. We are of the opinion that the groundwater noted on the logs provided to us is perched within sandier zones in the relatively impermeable matrix of the glacial till soils. GeoPacific installed an additional 4 groundwater monitoring wells at the site to further our understanding of the perched groundwater conditions. The relevant well installation details, and our initial manual groundwater level measurements are presented in Table 1 below.

**Table 1: Well Screen Details and Initial Groundwater Measurements**

Well #	Screened Interval (m bgs)	Water Level
		Nov 7, 2023
		m bgs
<b>MW23-01</b>	5.5 – 7.0	Dry
<b>MW23-02</b>	3.9 – 5.4	2.7
<b>MW23-03</b>	7.5 – 9.0	1.9
<b>MW23-04</b>	5.3 – 7.0	4.7

Our initial measurements suggest that the glacial soils near MW23-01 are relatively dry to a depth of approximately 7 m, while perched groundwater is present at depths ranging from 1.9 to 4.7 m below existing site grades at the remaining three monitoring wells. Our manual measurements are generally consistent with the perched groundwater levels included on the provided logs by others.

Some perched groundwater may also form at the contact with the upper weathered soils and the relatively impermeable glacial till soils. The main recharge mechanism for perched groundwater is the percolation of precipitation. As a result, we expect that perched groundwater levels would be highest during wetter periods of the year and during the spring melt. We further expect elevated moisture levels in the soils in areas directly adjacent to watercourses.

Temporary seepage from perched groundwater of this nature is typically relatively light and can likely be controlled using passive methods. Our drainage recommendations for are presented in Section 6.6 below.

## 5.0 DISCUSSION

### 5.1 General Comments

Information provided to us indicates that the proposed development could include multi-family dwellings, mixed-use buildings, community centres as well as parks and other natural protected areas, all accessed by new paved roads and accessways. We further understand that the majority of the new buildings would be constructed at grade while some of the multi-family or mixed-use structures may include underground parking levels extending down 2 to 3 levels below grade. We anticipate wood framed construction above grade and reinforced concrete construction for any buried basement levels. Structural loads are expected to range from relatively light to moderately heavy.

Based on the likely footing elevations, the soils present at the underside of the proposed foundations are expected to be compact to dense post glacial soils or dense glacial till. We expect that these soils will provide adequate support to use conventional pad and strip foundations.

We anticipate that some re-grading of the property will be completed to accommodate the development. Some of the underlying natural soils may be re-used as fill subject to our drill investigation, lab testing and approval.

As noted above, the excavation requirements should be revisited once the design has progressed, and the location and depth of any underground parking levels is available for our review. At this time, we expect that sloped excavations would be used where possible, but some form of vertical support would likely be required for buried parkades, depending on the finalized design.

The subsurface soils underneath the founding level are not expected to be prone to liquefaction or other forms of ground softening under the design earthquake defined under the 2018 British Columbia Building Code.

We expect that updated plans would be provided to GeoPacific for review well in advance of construction to provide further recommendations for the design and construction of the proposed development, if necessary. We further expect that additional drilling will be completed in areas of the site that were not accessible at the time of our investigation due to the presence of mature trees and other access constraints.

We confirm, from a geotechnical point of view, that the proposed development is feasible, provided the preliminary recommendations outlined in Section 6.0 are incorporated into the overall design.

### 5.2 Slope Stability

The site slopes gently towards the south/south west, though locally steeper at road cuts and ditches installed in the past. Based on our preliminary review of the borehole and survey information provided, the underlying materials have a high shear strength and the slopes are gently to moderate (mainly 10 to 15 degrees, increasing locally to 25 degrees) and therefore the possibility of near surface or deep-seated global instability are considered extremely remote. Erosion and surface wash outs due to site disturbance present the most significant natural hazard risk at the site. This risk can be addressed with appropriate erosion and sediment control (ESC) measures included into the work plan.

We can provide specific commentary regarding the guidelines for landslide assessment in British Columbia, "*Guidelines for Legislated Landslide Assessments for Proposed Residential Developments in BC*", Published March 1, 2023, once detailed design plans have been developed.

## 6.0 RECOMMENDATIONS

### 6.1 Site Preparation

Prior to construction of foundations, retaining walls, utilities, grade supported slabs, and pavement structures, all vegetation, topsoil, fills, soils containing organics and loose/soft or otherwise disturbed materials should be removed to expose a subgrade of compact to dense post glacial soils or dense glacial till.

Stripping should extend out beyond the building envelope and roads at a distance equal to the thickness of proposed engineered fill beneath the footings. For example, if 1 metre of engineered fill will underlie a footing then stripping should extend a minimum distance of 1 metre beyond the outer edge of that footing.

Stripping is not required in landscaped areas unless the criteria stated in the previous paragraph requires the removal of that material.

Should grade reinstatement be required in locations not supporting foundations, we recommend the use of engineered fill. "Engineered Fill" is defined as clean sand to sand and gravel containing silt and clay less than 5% by weight, compacted in 300 mm loose lifts to a minimum of 95% Modified Proctor maximum dry density at a moisture content that is within 2% of optimum for compaction. During fill placement, benches should be cut into any sloping stripped subgrade surfaces to key the structural fill into the natural topography. Grade reinstatement below foundation locations may require the use of minimum 5MPa lean mix concrete.

*Stripped subgrades and engineered fill materials and compaction must be reviewed by the geotechnical engineer.*

### 6.2 Foundations and Bearing Capacity

Based on the borehole information provided to us, we expect that footings would be placed on compact to dense post glacial sand or dense to very dense glacial till. Conventional pad and strip foundations may be used to support the proposed structures. Footings can be designed on the basis of a serviceability limit state (SLS) bearing pressure of:

- 120 kPa based on support on compact to dense post glacial sand
- 300 kPa based on support on dense to very dense glacial soils

Factored ultimate limit state (ULS) bearing pressures, for transient loads such as those induced by wind and earthquakes, may be taken as 1.5 x the SLS bearing pressure provided above. We estimate for foundations designed as recommended, settlements will not exceed 25 mm total and 2 mm per metre differential.

Irrespective of the allowable bearing pressures given, pad footings should not be less than 600 mm by 600 mm and strip footings should not be less than 450 mm in width. Footings should also be buried a minimum of 460 mm below the surface for frost protection.

Adjacent footings should achieve a maximum elevation difference equal to half of their horizontal distance to avoid superimposing the upper foundation loading to the lower foundation. Any footings, either strip or column footings, constructed within a 3.0 m proximity to the crest of a fill or soil slope should maintain a horizontal distance of 3.0 m from the face of the slope. This may require that the elevation of the footings be lowered to achieve the 3.0 m requirement. The depth and offset of proposed footings to any adjacent slope would need to be reviewed as part of a slope stability analysis once detailed development plans are available.

*Foundation subgrades must be reviewed by the geotechnical engineer prior to footing construction.*

### **6.3 Slab-on-Grade Floors**

In order to provide suitable support and drainage for slab-on-grade floors, we recommend that floor slabs should be underlain by a minimum of 150 mm of a free draining granular material, such as 19 mm clear crushed gravel, and hydraulically connected to perimeter drainage. The crushed gravel fill should be compacted to a minimum of 95% Modified Proctor dry density (ASTM D1557), at a moisture content that is within 2% of its optimum for compaction. A moisture barrier should underlie the slab directly above the free draining granular material.

If required, general grade reinstatement or backfill should be completed with engineered fill, as discussed in the site preparation section.

*The geotechnical engineer shall be contacted to review the slab-on-grade construction.*

### **6.4 Seismic Design of Foundations**

We have considered the 2018 BCBC design earthquake with a 2% probability of exceedance over a 50 year period which equates to a return period of 2,475 years. Accordingly, we have considered an earthquake having a peak horizontal ground acceleration of 0.323 g for this site (Ref. National Resources Canada, Site Coordinates: 49.309 deg. North, 122.870 deg. West).

This site qualifies as “Site Class C” as defined in Table 4.1.8.4.A of the 2018 British Columbia Building Code (BCBC).

### **6.5 Temporary Excavations**

No grading plans or building sections have been provided to us at this time, however, we expect that the majority of temporary excavations would be sloped where possible since it is more economical to do so. We would expect that slopes cut to a 1H:1V (1 horizontal to 1 vertical) can be constructed in the existing natural post glacial soils while 3H:4V may be constructed in the underlying dense glacial till. Flatter cut slopes may be required in areas with soft soils, or soils with active seepage (should they be encountered).

Some form of vertical support will likely be required for the contemplated underground parking levels. However, the excavation and shoring requirements will depend on the existing topography as well as the final design layout and elevation for the proposed structures.

If perched groundwater is encountered, we expect that it can be controlled using gravity drainage or sumps and sump pumps.

*Temporary cut slopes in excess of 1.2 m in height must be covered in poly sheeting and require inspection by a professional engineer in accordance with Work Safe B.C. guidelines, prior to worker-entry.*

### **6.6 Site and Foundation Drainage**

Given the existing slope of the site, we expect that the majority of drainage could be achieved by sloping stripped areas down gradient. In stripped or benched areas where perched groundwater or precipitation accumulates, it is anticipated that gravity drainage such as French drains, open channels or piping systems will be an effective means to convey any seepage from the construction area. Sumps and sump pumps may be required to convey perched inflows from relatively deep excavations in the location of underground parkade levels.

A perimeter drainage system, as described in the BCBC 2018, should be installed around any portion of a buried foundation wall to prevent the accumulation of water behind foundation walls and beneath slabs.

## 6.7 Utility Installation

For utilities bedded on compact to dense post glacial sand or dense glacial till, settlements are anticipated to be negligible. Groundwater seepage during utility installation may need to be controlled using sumps and sump pumps.

We recommend that any trenches be sloped or shored as per the latest Work Safe BC regulations. We recommend that all service trenches be backfilled with clean granular material, which conforms to municipal standards, compacted to 95% “Modified Proctor” dry density (ASTM D1557), with a moisture content within 2% of optimum for compaction.

## 6.8 Lateral Pressure of Foundation Walls

We understand that some underground levels may be included at the site. The earth pressure on these walls depends upon a number of factors including the backfill material, surcharge loads, backfill slope, drainage, rigidity of the basement or retaining wall, and method of construction including sequence and degree of compaction.

The method of construction of the excavation is expected to strongly influence design loads on the foundation walls. Lateral earth pressure theory suggests that cohesionless backfill soils placed in a sloped excavation are likely to provide higher earth pressure than fully shored excavation.

The following loads are provided based on the assumption of a sloped excavation of 3H:4V to 1H:1V backfilled with a free draining granular backfill with a unit weight of  $18 \text{ kN/m}^3$ , friction angle of 32 degrees, level backfill, and no surcharges. Heavier backfills or backfills with a lower angle of friction would be expected to induce higher loads.

We have assumed that a free draining granular backfill will be used behind the basement walls and that a perimeter drainage system will also be employed to collect any water from behind the walls. Therefore, our wall loading scenarios presented below assume that no water pressure will be generated behind the walls.

For a partially restrained basement wall designed for static pressure a pressure distribution should be employed of  $4.5H$  (kPa) triangular, where ‘H’ is the buried depth of the wall, in metres, below grade.

Dynamic loading induced by the 2020 National Building Code of Canada design earthquake should be added to the static loads and should be taken as  $3H$  (kPa) inverted triangular based on a peak horizontal ground acceleration of 0.323 g (Natural Resources Canada).

## 6.9 New Pavement Structures

As indicated above, new asphaltic concrete pavements are anticipated throughout the development. Following the recommended site preparation in Section 6.1, we expect that the following pavement design structure, given in Table 1, is sufficient to carry the anticipated vehicle traffic loads for on-site local roads.

**Table 2: Recommended Minimum Pavement Structure for Local Roads**

Material	Thickness (mm)
Asphaltic Concrete	85
19 mm minus crushed gravel base course	100
75 mm minus crushed gravel sub-base course	250

All base and sub-base fills should be compacted to a minimum of 95% Modified Proctor dry density with a moisture content within 2% of optimum for compaction.

The stripped road subgrade should be proof rolled to locate any soft/loose spots. Where existing soils are soft/loose and cannot be re-compacted to a minimum of 95% Modified Proctor dry density, they must be excavated and replaced with engineered fill.

## 7.0 DESIGN REVIEWS AND CONSTRUCTION INSPECTIONS

The preceding sections make recommendations for the design and construction of the proposed improvements. The report is based on preliminary information received at the time of the report preparation. We expect that the report would be updated once final design plan drawings are available. We have recommended the review of certain aspects of the design and construction in this report.

In summary, geotechnical field reviews for the following aspects of this scheme are required:

1. Review of site stripping
2. Review of foundation subgrade prior to footing construction
3. Review of slab-on-grade fill compaction prior to slab construction
4. Review of the compaction of engineered fill
5. Review of any temporary cut slopes or excavation in excess of 1.2 meters in height prior to worker-entry
6. Review of pavement structure subgrade prior to sub-base placement
7. Review of base and sub-base fill materials and compaction

It is critical that these reviews are carried out to ensure that our intentions have been adequately communicated. It is also critical that contractors working on the site view this document in advance of any work being carried out so that they become familiarised with the sensitive aspects of the works proposed. It is the responsibility of the developer to notify GeoPacific Consultants Ltd. when conditions or situations not outlined within this document are encountered.



## 8.0 CLOSURE

We are pleased to assist you with this project and we trust this information is helpful and sufficient for your purposes at this time. However, please do not hesitate to call the undersigned if you should require any clarification or additional details.

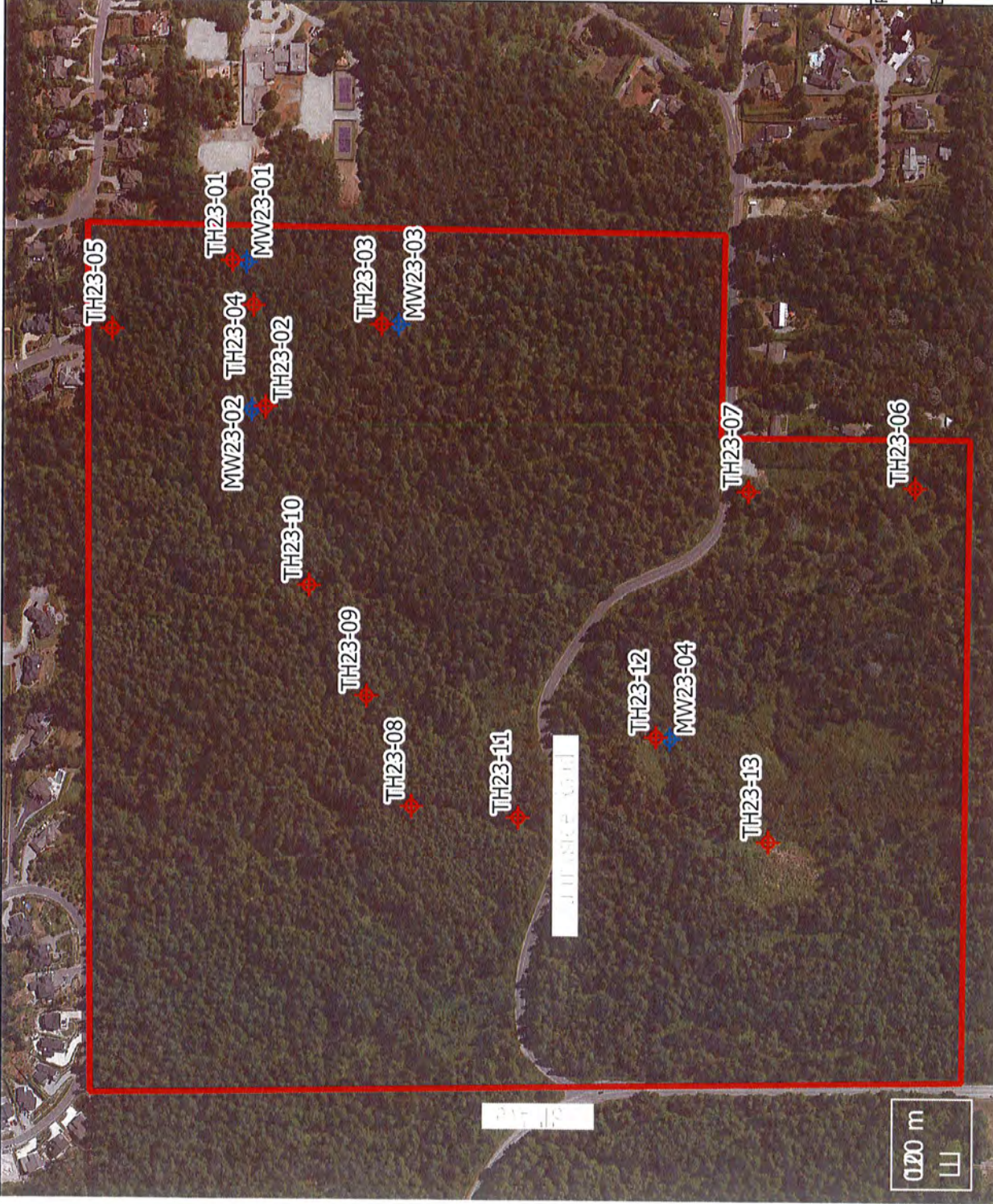
For:  
**GeoPacific Consultants Ltd.**

Reviewed by:






Adam Zywotkiewicz, B.Sc., P.Geo.  
Geologist

Matt Kokan, M.A.Sc., P.Eng.  
Principal



**LEGEND:**

-  SITE BOUNDARY
-  GROUNDWATER MONITORING WELL
-  TEST HOLE

REFERENCE:

BASEMAP COPYRIGHT GOOGLE (2023)



**GEO PACIFIC**  
CONSULTANTS

*GEOTECHNICAL INVESTIGATION  
SITE LOCATION PLAN*

DATE	14/07/23
SCALE	1:100

PROJECT NO.	23-01
CLIENT	...



SITE PLAN  
SCALE = NTS

LEGEND:

-  AH##-## - REFERENCE BOREHOLES
-  WTN 74082 - WRBC REFERENCE WELL

THE SITE EXTENT IS APPROXIMATE

REFERENCE:

OltheMap, 2021

REVISIONS:

- A.
- B.
- C.

FILE NO.: 21741

DWG. NO.: 21741-02



**GEOTECHNICAL INVESTIGATION**  
Anmore Lands, Anmore, BC  
REFERENCE BOREHOLES

DATE: 2023-11-15

DRAWN BY: AZ  
APPROVED BY: MJK  
REVIEWED BY: MJK

SCALE: NTS

## APPENDIX 'A'

# Test Hole Log: TH23-01-MW23-01

File: 21741

Project: Proposed Re-Development

Client: Icona Properties

Site Location: Anmore Lands, Anmore, B.C.



**GEOPACIFIC**  
CONSULTANTS

1779 W 75th Avenue, Vancouver, BC, V6P 6P2  
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev (m)				
0		Ground Surface	0.0				
0		<b>TOPSOIL</b> Silt, some organics, trace sand, soft, brown, moist	0.0	1			
0.6		<b>SILT (Post Glacial)</b> Silt, some organics, trace sand, soft, brown, moist to wet, sand is fine to medium grained	-0.6	1			
0.6		<b>SILTY SAND (Till Like)</b> Silty sand, grey, moist, dense to very dense, trace gravel	0.6		>50		
1.5		Dry from 1.5 m bgs					
6.1		Gravelly from 6.1 m bgs					
7.5		End of Borehole	-7.5				
7.5			7.5				Drill Refusal at 7.5 m bgs

Water level observed to be at 5.3 m bgs on October 19th, 2023

Drill Refusal at 7.5 m bgs

Logged: PMCS  
Method: S.S Auger  
Date: October 19th, 2023

Datum: Existing Grade  
Figure Number: A01  
Page: 1 of 1

# Test Hole Log: TH23-02-MW23-02

File: 21741

Project: Proposed Re-Development

Client: Icona Properties

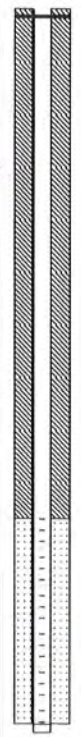
Site Location: Anmore Lands, Anmore, B.C.



**GEOPACIFIC**  
CONSULTANTS

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Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev (m)				
0		Ground Surface	0.0				
0		<b>TOPSOIL</b> Silt, some organics, trace sand, soft, brown, moist	0.0				
1		<b>SANDY SILT (Post Glacial)</b> Sandy silt, trace organics, firm, brown-grey, moist, sand is fine to medium grained	-0.9				
1		<b>SILT AND SAND (Till Like)</b> Silt and sand, trace to some gravel, grey, dry to damp, very stiff	0.9				
2		<b>GRAVELLY AND SANDY SILT (Till Like)</b> Gravelly and sandy silt, brown-grey to grey, dry to damp, very stiff, gravels are fine to coarse	-1.5				
2		Wet silty sand lense from 4.3 m to 4.6 m bgs	1.5				
3							
4							
5							
6							
6.7		End of Borehole	-6.7				
6.7			6.7				



Well observed to be dry on October 19th, 2023

Drill Refusal at 6.7 m bgs

Logged: PMCS  
Method: S.S Auger  
Date: October 19th, 2023

Datum: Existing Grade  
Figure Number: A02  
Page: 1 of 1

# Test Hole Log: TH23-03-MW23-03

File: 21741

Project: Proposed Re-Development

Client: Icona Properties

Site Location: Anmore Lands, Anmore, B.C.



**GEO PACIFIC**  
CONSULTANTS

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INFERRED PROFILE				Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev (m)				
0		Ground Surface	0.0				
0		<b>TOPSOIL</b> Silt, some organics, trace sand, soft, brown, moist	0.0				
0.8		<b>SILT (Weathered Till Like)</b> Silt, trace sand and gravel, grey, very stiff, dry to moist	0.8				
1.5		<b>GRAVELLY SILT (Till Like)</b> Gravelly silt, brown-grey to grey, dry to moist, very stiff, gravels are fine to medium	1.5				
3.1		grades to sandy from 3.1 m bgs					
6.1		Dark grey from 6.1 m bgs					
9.1		End of Borehole	-9.1				

Logged: PMCS Method: S.S Auger Date: October 19th, 2023	Datum: Existing Grade Figure Number: A03 Page: 1 of 1
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# Test Hole Log: TH23-04

File: 21741

Project: Proposed Re-Development

Client: Icona Properties

Site Location: Anmore Lands, Anmore, B.C.



**GEOPACIFIC**  
CONSULTANTS

1779 W 75th Avenue, Vancouver, BC, V6P 6P2  
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev (m)				
0		Ground Surface	0.0				
0		<b>TOPSOIL</b> Silt, some organics, trace sand, soft, brown, moist to wet	0.0				
1				1			
2				2			
3		<b>SILT (Weathered Till Like)</b> Silt, trace sand and gravel, grey to grey-brown, very stiff, moist	-0.8				
3			0.8		38		
4					35		
5		<b>SANDY SILT (Till Like)</b> Sandy silt, some gravel, grey, dry to moist, very stiff	-1.5				
5			1.5		>50		
6							
7							
8							
9							
10							
11							
12							
12		End of Borehole	-3.7				
12			3.7				Drill Refusal at 3.7 m bgs
13							
14							
15							

Logged: PMCS  
Method: S.S Auger  
Date: October 19th, 2023

Datum: Existing Grade  
Figure Number: A04  
Page: 1 of 1



# Test Hole Log: TH23-05

File: 21741

Project: Proposed Re-Development

Client: Iona Properties

Site Location: Anmore Lands, Anmore, B.C.



**GEOPACIFIC**  
CONSULTANTS

1779 W 75th Avenue, Vancouver, BC, V6P 6P2  
Tel. 604-439-0922 Fax 604-439-9189

INFERRED PROFILE				Moisture Content (%)	DCPT (blows per foot)	Groundwater / Well	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev (m)				
0		Ground Surface	0.0				
0		<b>TOPSOIL</b>	0.0				
1		Silt, some organics, trace sand, soft, brown, moist to wet	-0.5		4		
2		<b>SANDY AND GRAVELLY SILT (Till Like)</b>	0.5		10		
3	1	Sandy and gravelly silt, grey, dry to moist, very stiff			>50		
4		Hard drilling at 1.5 m bgs					
5		Wet silty sand from 3.1 to 3.7 m bgs					
6	2						
7							
8							
9							
10	3						
11							
12							
13	4						
14							
15							
16	5						
17							
18		End of Borehole	-5.5				Drill Refusal at 5.5 m bgs
19			5.5				
20	6						

Logged: PMCS  
Method: S.S Auger  
Date: October 19th, 2023

Datum: Existing Grade  
Figure Number: A05  
Page: 1 of 1

# Test Hole Log: TH23-06

File: 21741

Project: Proposed Re-Development

Client: Icona Properties

Site Location: Anmore Lands, Anmore, B.C.



**GEOPACIFIC**  
CONSULTANTS

1779 W 75th Avenue, Vancouver, BC, V6P 6P2  
Tel. 604-439-0922 Fax 604-439-9189

INFERRED PROFILE				Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev (m)				
0 ft 0 m		Ground Surface	0.0				
0		<b>TOPSOIL</b> Silt, some organics, some sand, soft, brown, wet	0.0				
1			-0.8	1			
2			-0.8	1			
3		<b>SILTY SAND</b> Silty sand, trace gravel, tan brown, moist to wet, dense to very dense	0.8				
4				21			
5							
6			-1.8				
7		<b>SILTY SAND (Till Like)</b> Silty sand, some fine to medium gravel, grey, moist to wet, very dense	1.8				
8							
9			-2.7				
10		End of Borehole	2.7				Drill Refusal at 2.7 m bgs
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

Logged: PMCS  
Method: S.S Auger  
Date: October 20th, 2023

Datum: Existing Grade  
Figure Number: A06  
Page: 1 of 1

# Test Hole Log: TH23-07

File: 21741

Project: Proposed Re-Development

Client: Iona Properties

Site Location: Anmore Lands, Anmore, B.C.



**GEOPACIFIC**  
CONSULTANTS

1779 W 75th Avenue, Vancouver, BC, V6P 6P2  
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev (m)				
0 ft 0 m		Ground Surface	0.0				
0		<b>TOPSOIL</b> Silty sand, some organics, soft to firm, brown, moist, trace gravel	0.0		2		
1			-0.6		6		
2		<b>SAND (Till Like)</b> Sand, some silt, trace gravel, grey, moist, very dense	0.6				
3					>50		
4		Grades to gravelly sand with some silt from 2.1 m to 3.1 m bgs			>50		
5							
6							
7							
8							
9							
10							
11							
12							
13			-4.0				
14		End of Borehole	4.0				Drill Refusal at 4.0 m bgs
15							
16							
17							
18							
19							
20							

Logged: PMCS  
Method: S.S Auger  
Date: October 20th, 2023

Datum: Existing Grade  
Figure Number: A07  
Page: 1 of 1

# Test Hole Log: TH23-08

File: 21741

Project: Proposed Re-Development

Client: Icona Properties

Site Location: Anmore Lands, Anmore, B.C.



**GEO PACIFIC**  
CONSULTANTS

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INFERRED PROFILE				Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev (m)				
0 ft 0 m		Ground Surface	0.0				
		<b>TOPSOIL</b>	0.0				
1		Silty sand, some organics, soft to firm, brown, moist, trace gravel					Drill Refusal at 0.2m bgs
2		<b>BOULDER / BEDROCK</b>					
3		End of Borehole					
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

Logged: PMCS  
Method: S.S Auger  
Date: October 20th, 2023

Datum: Existing Grade  
Figure Number: A08  
Page: 1 of 1

# Test Hole Log: TH23-09

File: 21741

Project: Proposed Re-Development

Client: Icona Properties

Site Location: Anmore Lands, Anmore, B.C.



**GEO PACIFIC**  
CONSULTANTS

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Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev (m)				
0 ft 0 m		Ground Surface	0.0				
		<b>TOPSOIL</b> Silty sand, some organics, loose, brown, moist, trace gravel	0.0				
1		<b>SILTY SAND (Till Like)</b> Silty sand, some gravel, grey, dry, very dense					
2							
3							
4							
5							
6			-1.8				
7		End of Borehole	1.8				Drill Refusal at 1.8 m bgs
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

Logged: PMCS  
Method: S.S Auger  
Date: October 20th, 2023

Datum: Existing Grade  
Figure Number: A09  
Page: 1 of 1

# Test Hole Log: TH23-10

File: 21741

Project: Proposed Re-Development

Client: Iona Properties

Site Location: Anmore Lands, Anmore, B.C.



**GEOPACIFIC**  
CONSULTANTS

1779 W 75th Avenue, Vancouver, BC V6P 6P2  
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INFERRED PROFILE				Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev (m)				
0 ft m		Ground Surface	0.0				
0		<b>TOPSOIL</b> Silty sand, some organics, loose, brown, moist	0.0				
1		<b>SAND AND GRAVEL</b> Sand and gravel, trace silt, wet, brown to grey, dense					
2							
3							
4							
5							
6							
7							
8			-2.4				
8		<b>SILTY SAND (Till Like)</b> Silty sand, some gravel, grey, dry to moist, very dense	2.4				
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21			-6.4				
21		End of Borehole	6.4				Drill Refusal at 6.4 m bgs
22							

Logged: PMCS  
Method: S.S Auger  
Date: October 20th, 2023

Datum: Existing Grade  
Figure Number: A10  
Page: 1 of 1

# Test Hole Log: TH23-11

File: 21741

Project: Proposed Re-Development

Client: Iona Properties

Site Location: Anmore Lands, Anmore, B.C.



**GEOPACIFIC**  
CONSULTANTS

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INFERRED PROFILE				Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev (m)				
0		Ground Surface	0.0				
0		<b>TOPSOIL</b> Silty sand, some organics, loose, brown, moist, trace gravel	0.0				
1		<b>SILT</b> Silt, grey, dry, trace gravel, stiff to very stiff					
1.4			-1.4				
1.4		<b>SAND (Till Like)</b> Sand, trace to some gravel, trace silt, grey, dry, very dense	1.4				
2.7			-2.7				
2.7		End of Borehole	2.7				Drill Refusal at 2.7 m bgs

Logged: PMCS  
Method: S.S Auger  
Date: October 20th, 2023

Datum: Existing Grade  
Figure Number: A11  
Page: 1 of 1

# Test Hole Log: TH23-12 -MW23-04

File: 21741

Project: Proposed Re-Development

Client: Iona Properties

Site Location: Anmore Lands, Anmore, B.C.



**GEOPACIFIC**  
CONSULTANTS

1779 W 75th Avenue, Vancouver, BC, V6P 6P2  
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev (m)				
0		Ground Surface	0.0				
0		<b>TOPSOIL</b> Silty sand, some organics, loose to compact, brown, moist to dry	0.0				
1		<b>SAND</b> Sand, some gravel, trace silt, brown, moist, dense, sand is medium grained					
2		Turns grey from 1.8 m bgs					
2.4		<b>SAND (Till Like)</b> Sand, some gravel, trace silt, grey, moist, dense, sand is medium grained	-2.4				
4.6		<b>GRAVELLY SAND (Till Like)</b> Gravelly sand, grey, wet, very dense, gravels are fine, trace to some silt	-4.6				
7.5		<b>SILTY SAND (Till Like)</b> Silty sand, some gravel, moist, very dense, grey to blue-grey	-7.5				
9.1		End of Borehole	-9.1				

Water level observed to be at 4.6 m bgs on October 20th, 2023

Logged: PMCS  
Method: S.S Auger  
Date: October 20th, 2023

Datum: Existing Grade  
Figure Number: A12  
Page: 1 of 1



# Test Hole Log: TH23-13

File: 21741

Project: Proposed Re-Development

Client: Icona Properties

Site Location: Anmore Lands, Anmore, B.C.



**GEOPACIFIC**  
CONSULTANTS

1779 W 75th Avenue, Vancouver, BC V6P 6P2  
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE				Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev (m)				
0		Ground Surface	0.0				
0		<b>TOPSOIL</b> Silt, some organics, trace sand and gravel, soft, brown, moist to wet	0.0				
1		<b>SAND (Weathered Till Like to Till Like)</b> Sand, some gravel, trace silt, grey, very dense, moist			8		
2							
3							
4							
5		Grades to gravelly and silty from 1.2 m bgs					
6							
7							
8							
9							
10							
11							
12							
13							
14			-4.3				
14		<b>SANDY SILT (Till Like)</b> Sandy silt, some gravel, grey, dry to moist, very stiff	4.3				
15							
16							
17							
18							
19							
20							
		End of Borehole					
							Drill Refusal at 4.5 m bgs

Logged: PMCS  
Method: S.S Auger  
Date: October 19th, 2023

Datum: Existing Grade  
Figure Number: A13  
Page: 1 of 1



# Soil LOG AH2019-01

<b>PROJECT NUMBER</b> 2019-P27 <b>PROJECT NAME</b> Burrad Commons Project <b>CLIENT</b> IOCO AM Development LP <b>ADDRESS</b> 1600-1700 Sunnyside Street Anmore <b>Borehole No.</b> AH2019-01	<b>DRILLING DATE</b> Sep/05/2019 <b>TOTAL DEPTH</b> 5m <b>DIAMETER</b> 6" <b>CASING</b> uPVC <b>SCREEN</b> uPVC Factory Slotted	<b>COORDINATES</b> <b>COORD SYS</b> <b>SURFACE ELEVATION</b> <b>Water in WELL</b> 1.2m below grade(Sep 5, 2019) <b>Water in WELL</b> 0.1m below grade(Sep 13,2019)
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**COMMENTS** Near the Parking lot-refer to Figure 1 in Appendix -A

**LOGGED BY** GZ  
**CHECKED BY** ZY

Samples	Depth (m)	Graphic Log	DCPT N	Material Description	Liquid Limit	Moisture	Plastic Limit	Well Diagram
	0.2		0	Top Soil(OM),soft, damp, dark brown with rootlet				
S1@2ft	0.4		0	Sandy Silt(LM),soft to firm, damp,whitish grey, with trace organic	45%	20%	16%	
	0.6		12	Sand(SW), compact, grey,wet,medium grain, well graded				
S2@3ft	0.8		56					
S3@3ft	1.2		Refusal	Till-like(SW_GP), silt and sand with some to trace gravel,very dense,gre,y,wet				
	1.4							
	1.6							
	1.8							
	2.0							
	2.2							
	2.4							
	2.6							
	2.8							
S4@10ft	3.0							
	3.2							
	3.4							
	3.6							
	3.8							
	4.0							
	4.2							
S5@14ft	4.4							
	4.6							
	4.8							
	5.0			Termination Depth at:5 m				
	5.2							



# Soil LOG AH2019-02

<b>PROJECT NUMBER</b> 2019-P27 <b>PROJECT NAME</b> Burrad Commons Project <b>CLIENT</b> IOCO AM Development LP <b>ADDRESS</b> 1600-1700 Sunnyside Street Anmore <b>Borehole No.</b> AH2019-02	<b>DRILLING DATE</b> Sep/05/2019 <b>TOTAL DEPTH</b> 5m <b>DIAMETER</b> 6" <b>CASING</b> uPVC <b>SCREEN</b> uPVC Factory Slotted	<b>COORDINATES</b> <b>COORD SYS</b> <b>SURFACE ELEVATION</b> <b>Water in WELL</b> 0.9m below grade(Sep 5, 2019) <b>Water in WELL</b> 0.2m below grade(Sep 13,2019)
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**COMMENTS** Near Crest of Steep slope-refer to Figure 1 in Appendix -A

**LOGGED BY** GZ  
**CHECKED BY** ZY

Samples	Depth (m)	Graphic Log	DCPT N	Material Description	Liquid Limit	Moisture	Plastic Limit	Well Diagram
	0.2		0	Organic Silt(OM),soft and weak, damp,dark brown with roots		35%		
S1@1ft	0.4		6	Sand(SW), loose to dense, yellowish,damp,medium grain, well graded				
S2@2ft	0.6		5					
	0.8		50					
	1.0							
S3@4ft	1.2		50@6" refusal	Till-like(SW_GP), sand and gravel with some to trace silt,very dense,gre,y,wet				
	1.4							
	1.6							
	1.8							
	2.0							
	2.2							
	2.4							
	2.6							
	2.8							
S4@10ft	3.0							
	3.2							
	3.4							
	3.6							
	3.8							
	4.0							
	4.2							
S5@14ft	4.4							
	4.6							
	4.8			Termination Depth at:5 m				

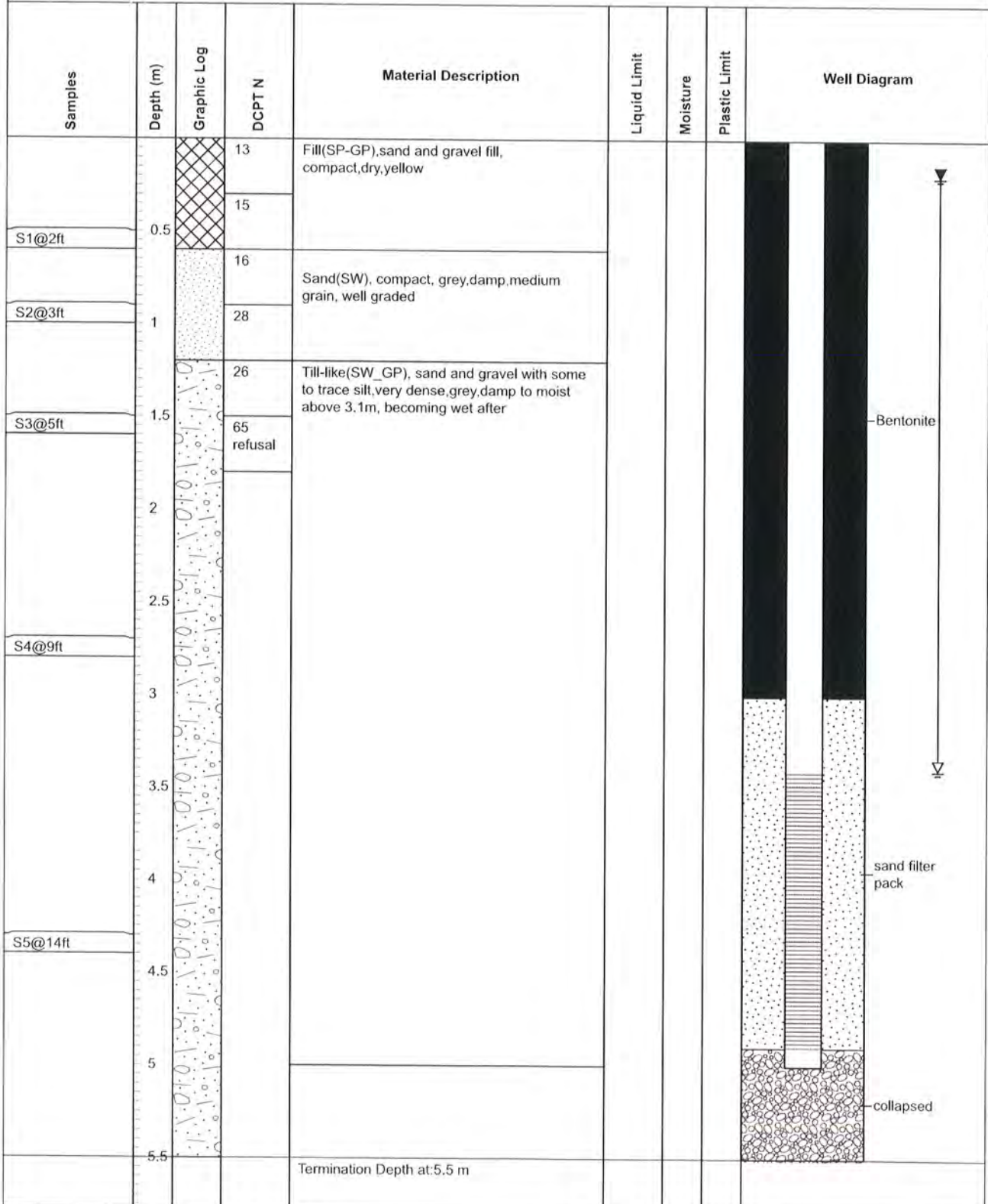


# Soil LOG AH2019-03

<b>PROJECT NUMBER</b> 2019-P27 <b>PROJECT NAME</b> Burrad Commons Project <b>CLIENT</b> IOCO AM Development LP <b>ADDRESS</b> 1600-1700 Sunnyside Street Anmore <b>Borehole No.</b> AH2019-03	<b>DRILLING DATE</b> Sep/05/2019 <b>TOTAL DEPTH</b> 5.5m <b>DIAMETER</b> 6" <b>CASING</b> uPVC <b>SCREEN</b> uPVC Factory Slotted	<b>COORDINATES</b> <b>COORD SYS</b> <b>SURFACE ELEVATION</b> <b>Water in WELL</b> 3.4m below grade(Sep 5, 2019) <b>Water in WELL</b> 0.2m below grade(Sep 13,2019)
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**COMMENTS** Near creek-refer to Figure 1 in Appendix -A

**LOGGED BY** GZ  
**CHECKED BY** ZY





# Soil LOG AH2019-04

<b>PROJECT NUMBER</b> 2019-P27 <b>PROJECT NAME</b> Burrad Commons Project <b>CLIENT</b> IOCO AM Development LP <b>ADDRESS</b> 1600-1700 Sunnyside Street Anmore <b>Borehole No.</b> AH2019-04	<b>DRILLING DATE</b> Sep/05/2019 <b>TOTAL DEPTH</b> 4.6m <b>DIAMETER</b> 6" <b>CASING</b> uPVC <b>SCREEN</b> uPVC Factory Slotted	<b>COORDINATES</b> <b>COORD SYS</b> <b>SURFACE ELEVATION</b> <b>Water in WELL</b> 3.7m below grade(Sep 5, 2019) <b>Water in WELL</b> 3.2m below grade(Sep 13,2019)
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**COMMENTS** middle of trail near north end-refer to Figure 1 in Appendix -A

**LOGGED BY** GZ  
**CHECKED BY** ZY

Samples	Depth (m)	Graphic Log	DCPT N	Material Description	Liquid Limit	Moisture	Plastic Limit	Well Diagram
	0.2	[Graphic Log: Sand]	7	Sand(SW), sand with trace fine gravel, loose to dense, damp, yellowish, density increase with depth				[Well Diagram: backfill]
	0.4		6					
	0.6		15					
	0.8		31					
	1.0		52					
S1@4ft	1.2							
	1.4							
	1.6	[Graphic Log: Till-like]	refusal	Till-like(SW), sand with some to trace gravel, very dense, grey, damp above 2.0m and moist above 3.0m, becoming wet after, medium grain clean sand				[Well Diagram: Bentonite]
	1.8							
	2.0							
	2.2							
	2.4							
	2.6							
S2@9ft	2.8							
	3.0							
	3.2							
	3.4							
	3.6							
	3.8							
S3@13t	4.0							[Well Diagram: sand filter pack]
	4.2							
	4.4							
	4.6							
	4.8							
	5.0			Termination Depth at: 4.6 m				
	5.2							



# Soil LOG AH2019-05

<b>PROJECT NUMBER</b> 2019-P27 <b>PROJECT NAME</b> Burrad Commons Project <b>CLIENT</b> JOCO AM Development LP <b>ADDRESS</b> 1600-1700 Sunnyside Street Anmore <b>Borehole No.</b> AH2019-05	<b>DRILLING DATE</b> Sep/05/2019 <b>TOTAL DEPTH</b> 5.5m <b>DIAMETER</b> 6 <b>CASING</b> uPVC <b>SCREEN</b> uPVC Factory Slotted	<b>COORDINATES</b> <b>COORD SYS</b> <b>SURFACE ELEVATION</b> <b>Water in WELL</b> dry on Sep 5, 2019 <b>Water in WELL</b> dry Sep 13,2019
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**COMMENTS** middle of trail near south end-refer to Figure 1 in Appendix -A

**LOGGED BY** GZ  
**CHECKED BY** ZY

Samples	Depth (m)	Graphic Log	DCPT N	Material Description	Liquid Limit	Moisture	Plastic Limit	Well Diagram
			4	Sand(SW), sand with trace fine gravel, loose to dense, damp, yellowish, density increase with depth				<p style="text-align: right;">backfill</p>
	0.5		2					
S1@2ft			18					
	1		70					
			Refusal	Till-like(SW), sand with some to trace gravel, very dense, grey, damp above 2.0m and moist above 3.0m, becoming wet after, medium grain clean sand				<p style="text-align: right;">Bentonite</p>
S2@4ft	1.5							
	2			gravel and cobbles and boulders seam from 3.0 to 4.0m,				<p style="text-align: right;">sand filter pack</p>
S3@9ft	2.5							
	3							
	4			Termination Depth at: 5.5m m/dry hole				<p style="text-align: right;">collapsed</p>
S4@14ft	4.5							
	5							
	5.5							Termination Depth at: 5.5m m/dry hole