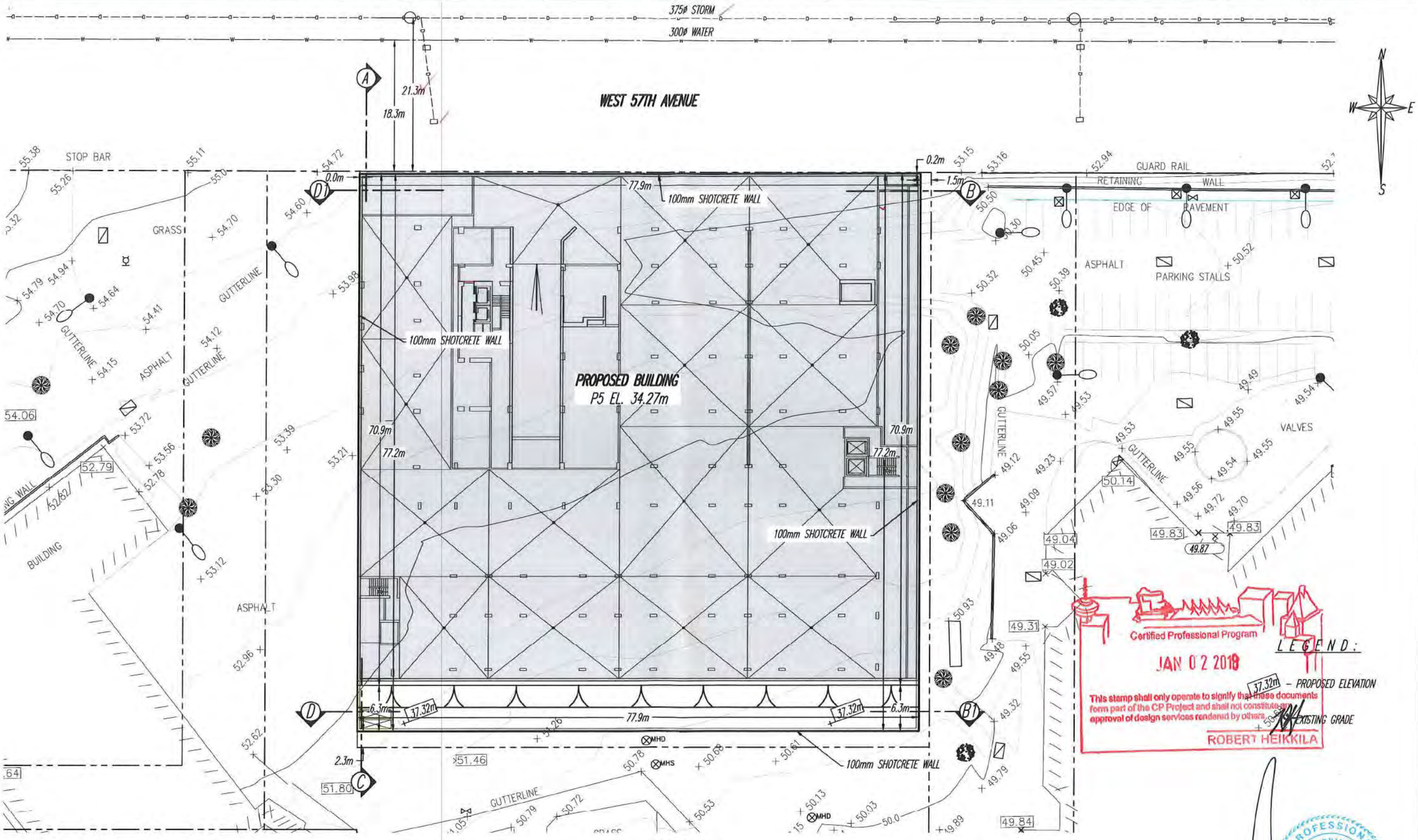

SITE PLAN

SCALE = 1:500

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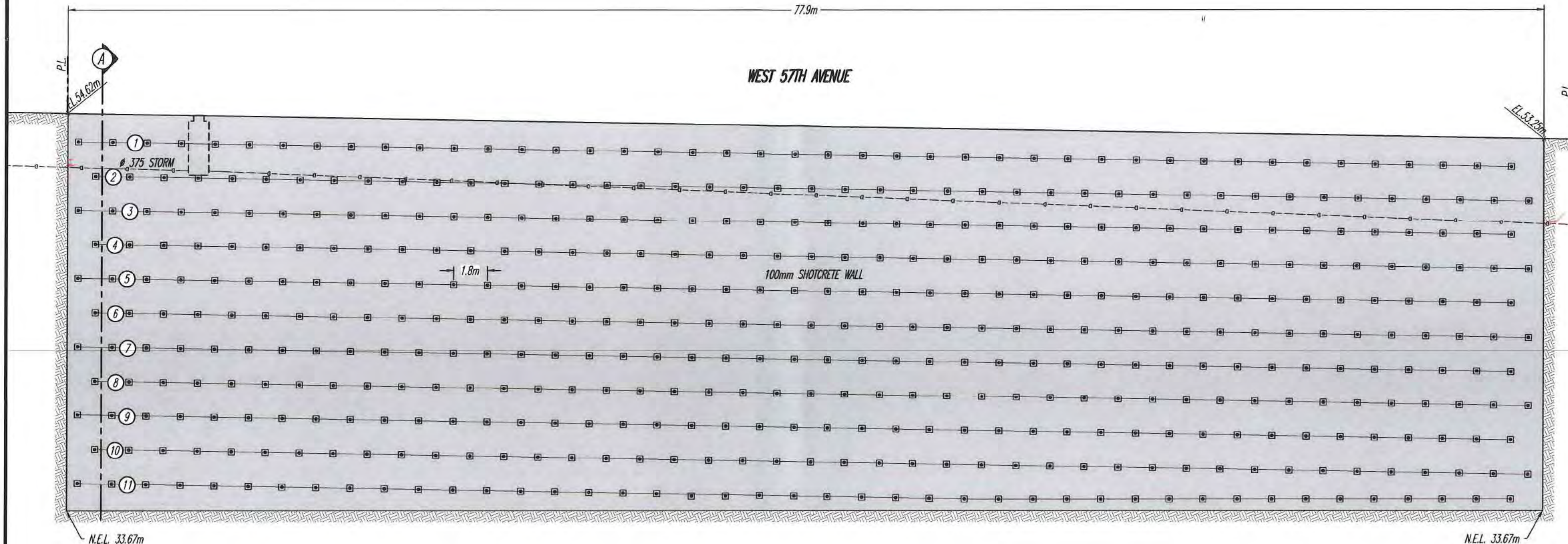

NORTH ELEVATION

SCALE = 1:200

LEGEND:

EL.52.0m - PROPOSED ELEVATION

N.E.L. - NOMINAL EXCAVATION LEVEL AT PERIMETER = SLAB EL - 0.6m OR AS SHOWN

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ROBERT HEIKKILA

PROFESSIONAL PROVINCE OF BRITISH COLUMBIA M. J. KOKAN # 21364 ENGINEER

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		DRAWN BY: C.T. APPROVED BY: M.J.K. REVIEWED BY: D.K.	~~500 & 650~~ 688 WEST 57TH AVENUE, VANCOUVER, B.C.	DWG. NO.: G-S2A	A. B.
		SCALE: AS SHOWN	SHORING - NORTH ELEVATION		C.

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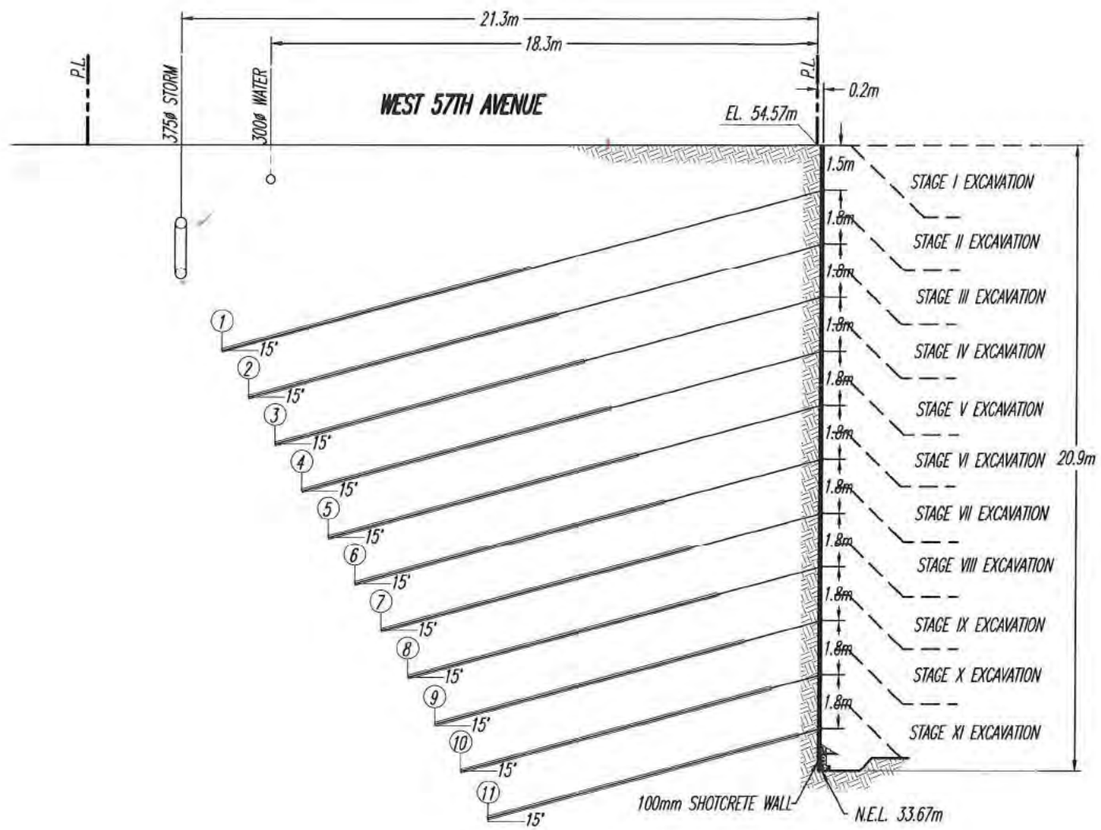

SECTION A

SCALE = 1:200

SECTION A
DYWIDAG ø10 Gr 75/100 OR APPROVED ALTERNATE

ROW	LENGTH (m/ft)	GROUTED (m/ft)	LOCKOFF (kips)	SPACING (m/ft)
1	20.8/68	10.7/35	62	1.8/6
2	19.8/65	10.7/35	62	1.8/6
3	18.8/62	10.7/35	62	1.8/6
4	18.0/59	10.7/35	62	1.8/6
5	17.1/56	10.7/35	62	1.8/6
6	16.2/53	10.7/35	62	1.8/6
7	15.2/50	10.7/35	62	1.8/6
8	14.3/47	10.7/35	62	1.8/6
9	13.4/44	10.7/35	62	1.8/6
10	12.5/41	10.7/35	62	1.8/6
11	11.6/38	10.7/35	62	1.8/6

CONTRACTOR TO CONFIRM
LOCATION OF ALL U/G UTILITIES

LEGEND:

N.E.L. – NOMINAL EXCAVATION LEVEL
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	1779 W. 75th Avenue, Vancouver, B.C. V6P 6P2	DRAWN BY: C.T. / APPROVED BY: M.J.K. / REVIEWED BY: D.K.	~~500 & 650~~ WEST 57TH AVENUE, VANCOUVER, B.C.	DWG. NO.: G-S2B	A.
	P 604.439.0922 F 604.439.9189	SCALE: AS SHOWN	688 SHORING – SECTION A		B.
					C.

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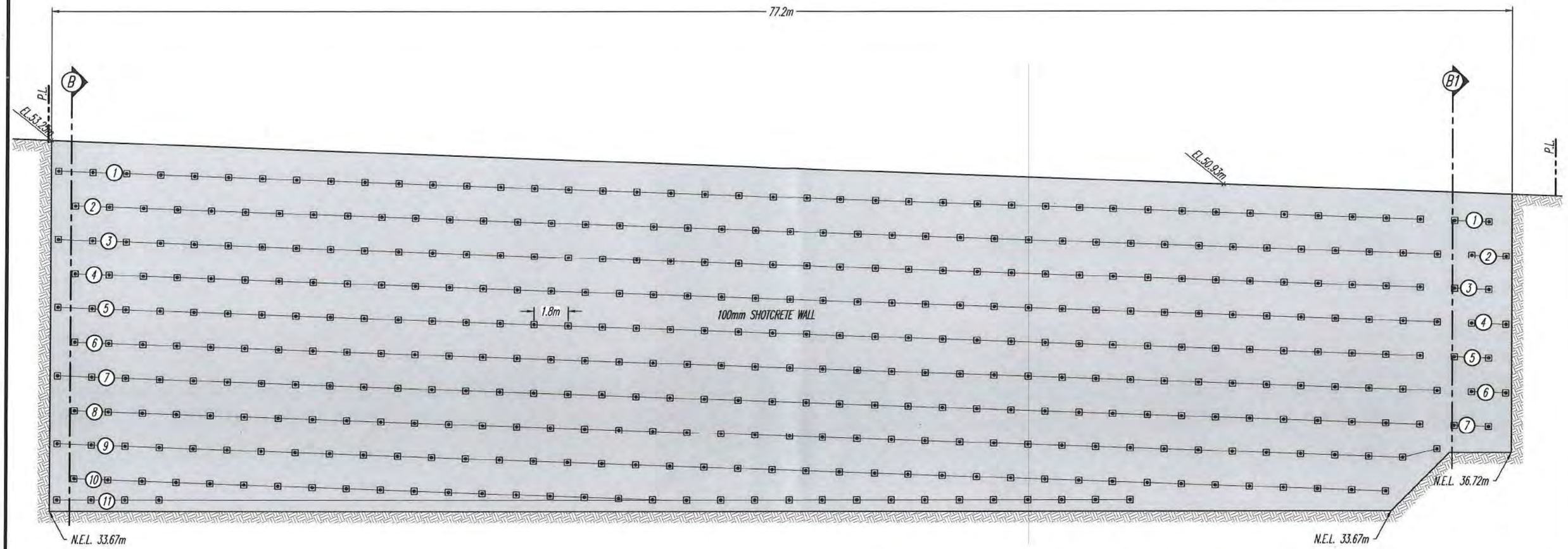

EAST ELEVATION

SCALE = 1:200

LEGEND:

EL.52.0m – PROPOSED ELEVATION

N.E.L. – NOMINAL EXCAVATION LEVEL AT PERIMETER = SLAB EL – 0.6m OR AS SHOWN

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DATE:	NOVEMBER 30, 2018	
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SCALE: AS SHOWN		

CAMBIE GARDEN PARCEL C
~~500 & 650~~ 688 WEST 57TH AVENUE, VANCOUVER, B.C.
SHORING – EAST ELEVATION

FILE NO.: 12376-C
DWG. NO.: G-S3A

REVISIONS:
A.
B.
C.

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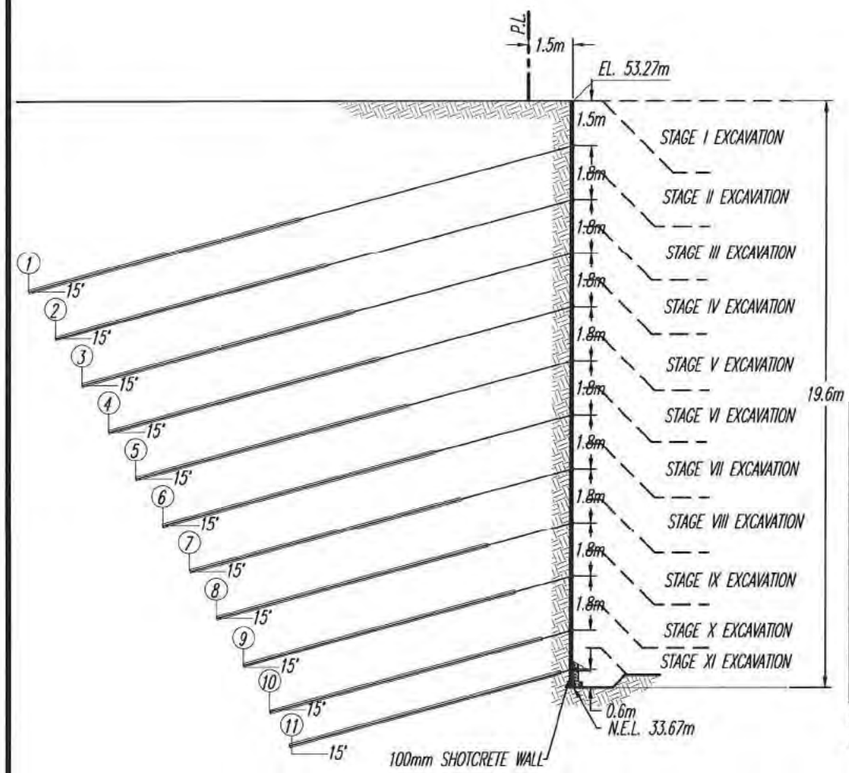
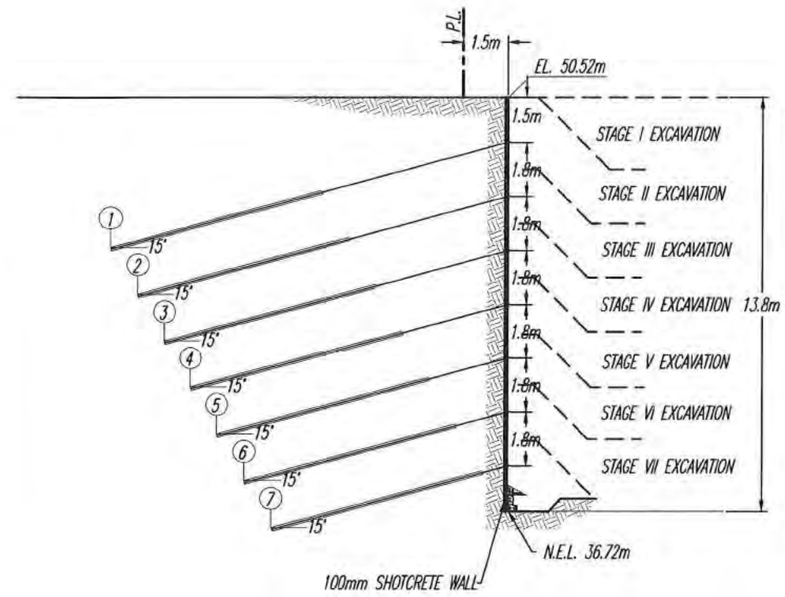


SECTION B
DYWIDAG #10 Gr 75/100 OR APPROVED ALTERNATE

ROW	LENGTH (m/ft)	GROUTED (m/ft)	LOCKOFF (kips)	SPACING (m/ft)
1	18.9/62	9.4/31	55	1.8/6
2	18.0/59	9.4/31	55	1.8/6
3	17.1/56	9.4/31	55	1.8/6
4	16.2/53	9.4/31	55	1.8/6
5	15.2/50	9.4/31	55	1.8/6
6	14.3/47	9.4/31	55	1.8/6
7	13.4/44	9.4/31	55	1.8/6
8	12.5/41	9.4/31	55	1.8/6
9	11.6/38	9.4/31	55	1.8/6
10	10.7/35	9.4/31	55	1.8/6
11	9.8/32	9.4/31	55	1.8/6

CONTRACTOR TO CONFIRM
LOCATION OF ALL U/G UTILITIES

SECTION B
SCALE = 1:200



SECTION B1
DYWIDAG #9 Gr 75/100 OR APPROVED ALTERNATE

ROW	LENGTH (m/ft)	GROUTED (m/ft)	LOCKOFF (kips)	SPACING (m/ft)
1	13.7/45	7.3/24	42	1.8/6
2	12.8/42	7.3/24	42	1.8/6
3	11.9/39	7.3/24	42	1.8/6
4	11.0/36	7.3/24	42	1.8/6
5	10.1/33	7.3/24	42	1.8/6
6	9.1/30	7.3/24	42	1.8/6
7	8.2/27	7.3/24	42	1.8/6

CONTRACTOR TO CONFIRM
LOCATION OF ALL U/G UTILITIES

SECTION B1
SCALE = 1:200

LEGEND:

N.E.L. – NOMINAL EXCAVATION LEVEL
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CAMBIE GARDEN PARCEL C
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SHORING – SECTION B & B1

FILE NO.: 12376-C
DWG. NO.: G-S3B

REVISIONS:
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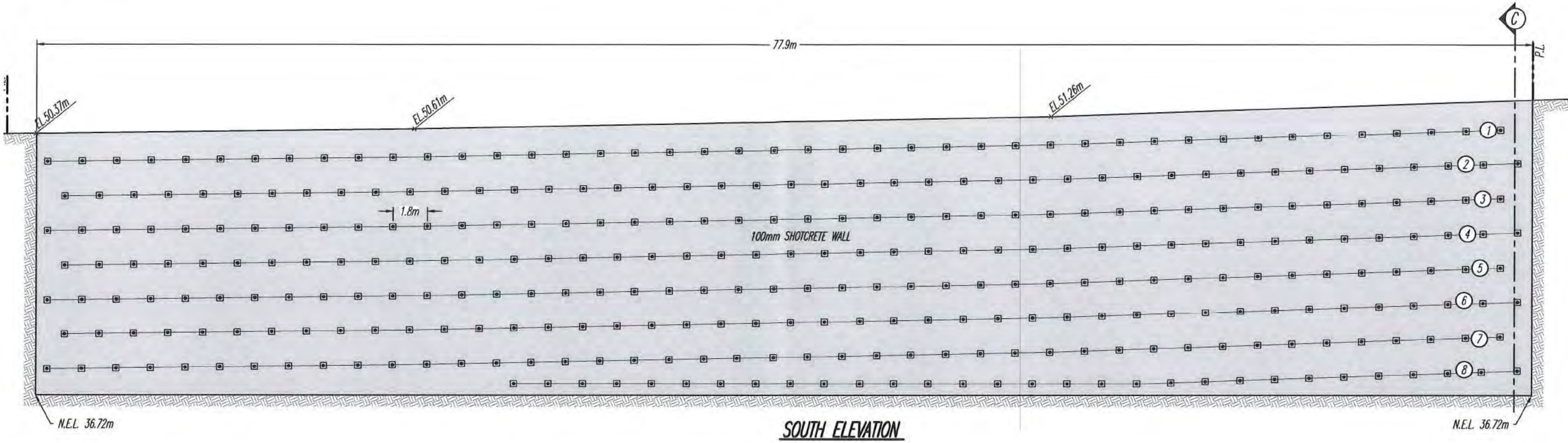

SOUTH ELEVATION

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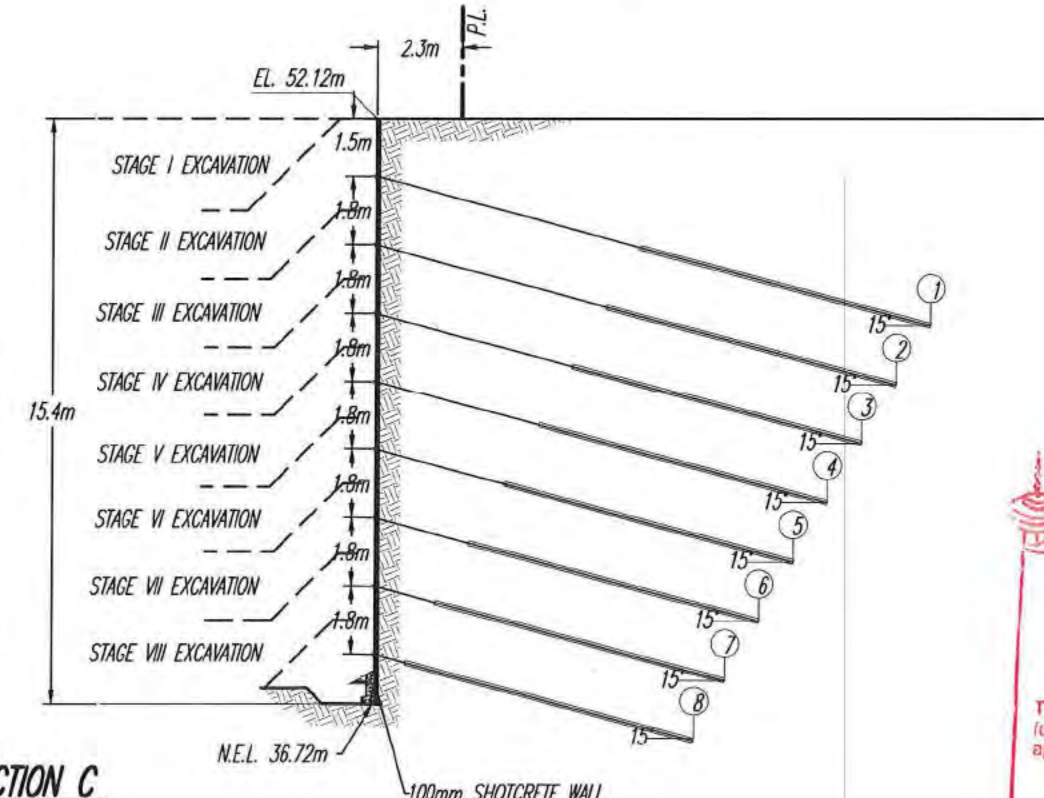

SECTION C

SCALE = 1:200

SECTION C
DYWIDAG #9 Gr 75/100 OR APPROVED ALTERNATE

ROW	LENGTH (m/ft)	GROUTED (m/ft)	LOCKOFF (kips)	SPACING (m/ft)
1	15.2/50	7.9/26	46	1.8/6
2	14.3/47	7.9/26	46	1.8/6
3	13.4/44	7.9/26	46	1.8/6
4	12.5/41	7.9/26	46	1.8/6
5	11.6/38	7.9/26	46	1.8/6
6	10.7/35	7.9/26	46	1.8/6
7	9.8/32	7.9/26	46	1.8/6
8	8.8/29	7.9/26	46	1.8/6

CONTRACTOR TO CONFIRM
LOCATION OF ALL U/G UTILITIES

LEGEND:

EL.52.0m - PROPOSED ELEVATION

N.E.L. - NOMINAL EXCAVATION LEVEL AT PERIMETER = SLAB EL - 0.6m OR AS SHOWN

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		DRAWN BY: C.T. / APPROVED BY: M.J.K. / REVIEWED BY: D.K.	~~500 & 650~~ WEST 57TH AVENUE, VANCOUVER, B.C.	DWG. NO.: G-S4	A. / B. / C.
		SCALE: AS SHOWN	SHORING - SOUTH ELEVATION & SECTION C		

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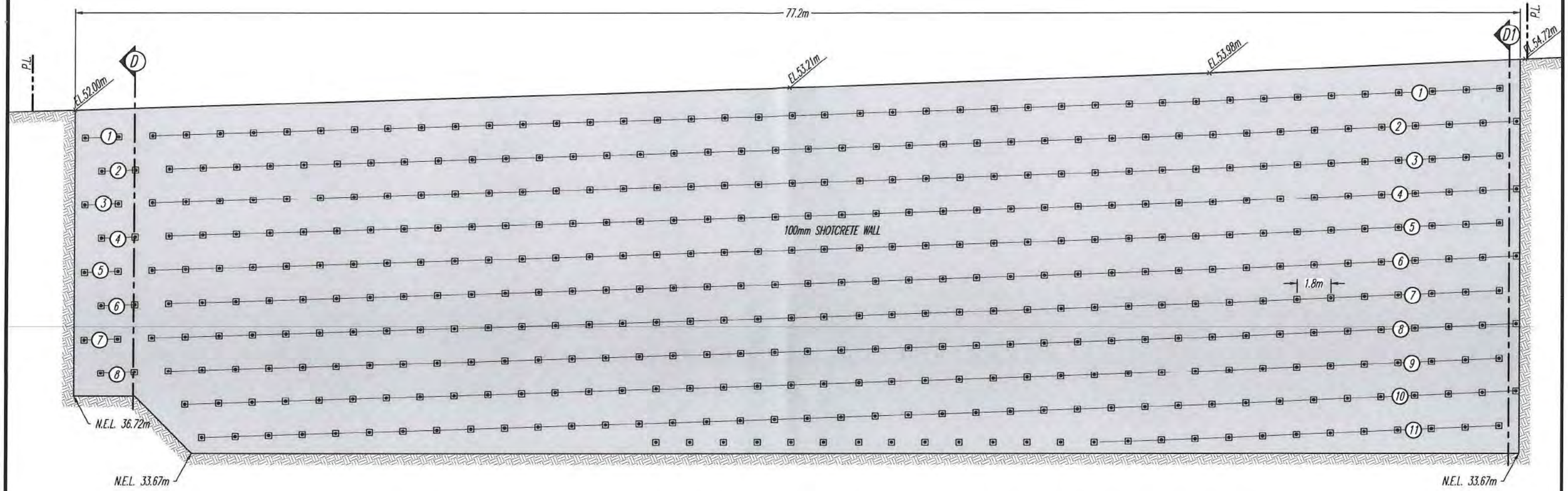

WEST ELEVATION

SCALE = 1:200

LEGEND:

EL.52.0m – PROPOSED ELEVATION

N.E.L. – NOMINAL EXCAVATION LEVEL AT PERIMETER = SLAB EL – 0.6m OR AS SHOWN

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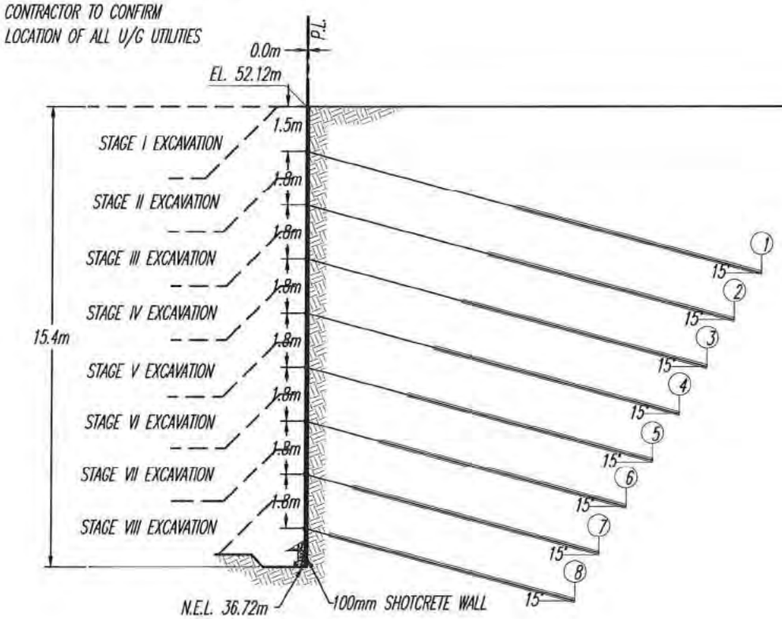
		DRAWN BY: C.T.	APPROVED BY: M.J.K.	REVIEWED BY: D.K.		DWG. NO.: G-S5A	A.
		SCALE: AS SHOWN					B.
							C.

SECTION D
DYWIDAG #9 Gr 75/100 OR APPROVED ALTERNATE

ROW	LENGTH (m/ft)	GROUTED (m/ft)	LOCKOFF (kips)	SPACING (m/ft)
1	15.2/50	7.9/26	46	1.8/6
2	14.3/47	7.9/26	46	1.8/6
3	13.4/44	7.9/26	46	1.8/6
4	12.5/41	7.9/26	46	1.8/6
5	11.6/38	7.9/26	46	1.8/6
6	10.7/35	7.9/26	46	1.8/6
7	9.8/32	7.9/26	46	1.8/6
8	8.8/29	7.9/26	46	1.8/6

CONTRACTOR TO CONFIRM
LOCATION OF ALL U/G UTILITIES



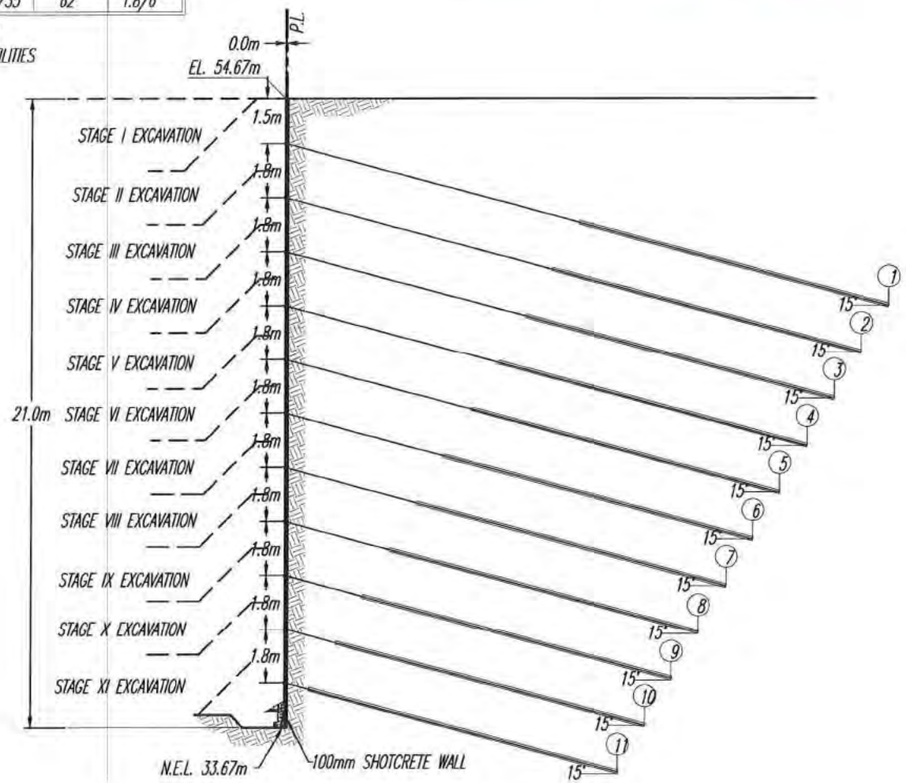
SECTION D

SCALE = 1:200

SECTION D1
DYWIDAG #10 Gr 75/100 OR APPROVED ALTERNATE

ROW	LENGTH (m/ft)	GROUTED (m/ft)	LOCKOFF (kips)	SPACING (m/ft)
1	20.8/68	10.7/35	62	1.8/6
2	19.8/65	10.7/35	62	1.8/6
3	18.8/62	10.7/35	62	1.8/6
4	18.0/59	10.7/35	62	1.8/6
5	17.1/56	10.7/35	62	1.8/6
6	16.2/53	10.7/35	62	1.8/6
7	15.2/50	10.7/35	62	1.8/6
8	14.3/47	10.7/35	62	1.8/6
9	13.4/44	10.7/35	62	1.8/6
10	12.5/41	10.7/35	62	1.8/6
11	11.6/38	10.7/35	62	1.8/6

CONTRACTOR TO CONFIRM
LOCATION OF ALL U/G UTILITIES



SECTION D1

SCALE = 1:200

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LEGEND:

N.E.L. – NOMINAL EXCAVATION LEVEL
AT PERIMETER = SLAB EL – 0.6m
OR AS SHOWN

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PROVINCE OF BRITISH COLUMBIA
M. J. KOKAN
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DATE: NOVEMBER 30, 2018
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SCALE: AS SHOWN

CAMBIE GARDEN PARCEL C
~~500 & 650~~ 688 WEST 57TH AVENUE, VANCOUVER, B.C.
SHORING – SECTION D & D1

FILE NO.: 12376-C
DWG NO.: G-S5B

REVISIONS:
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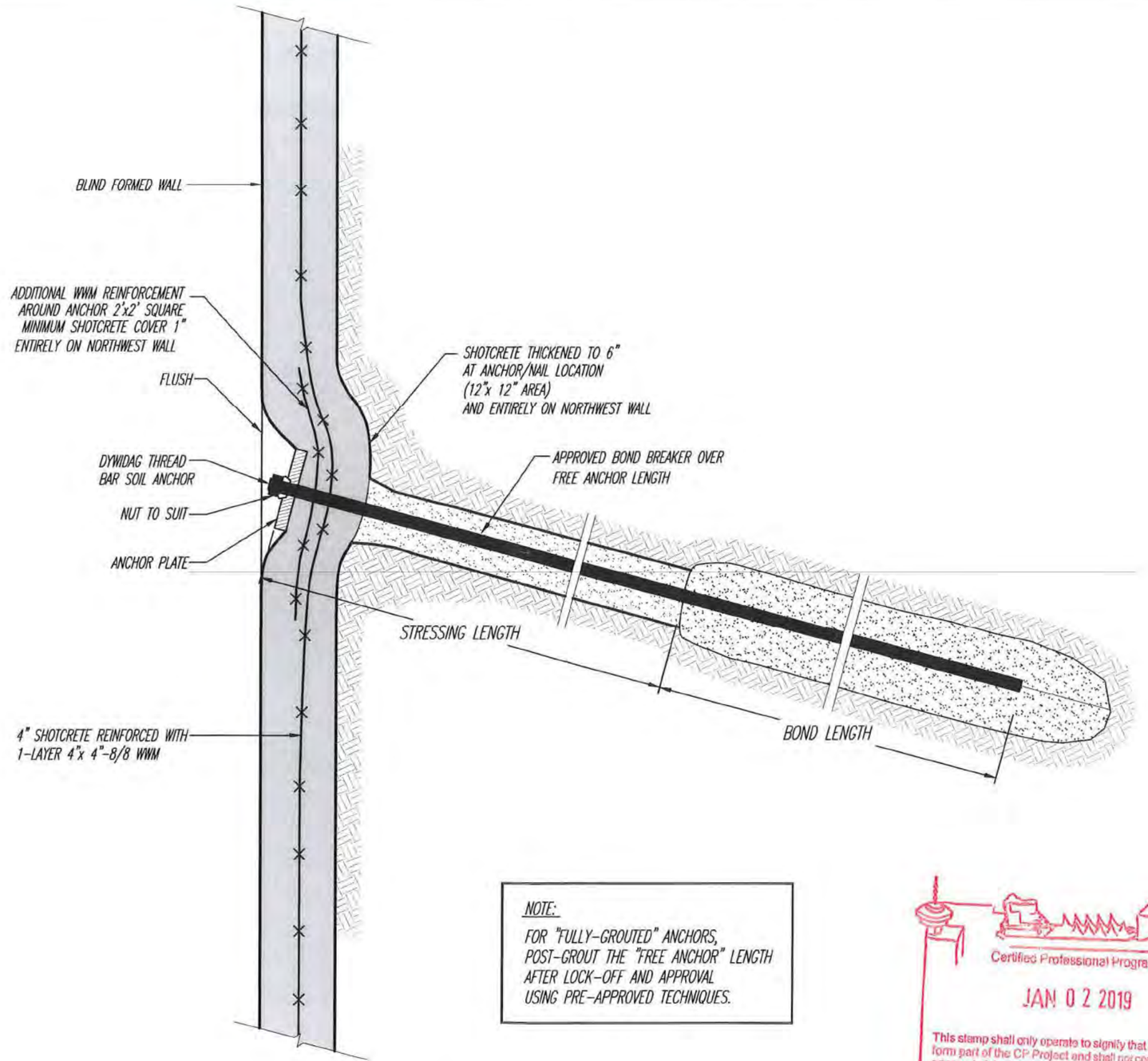

NOTE:
FOR "FULLY-GROUTED" ANCHORS, POST-GROUT THE "FREE ANCHOR" LENGTH AFTER LOCK-OFF AND APPROVAL USING PRE-APPROVED TECHNIQUES.

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ANCHORED SHOTCRETE DETAIL
N.T.S.

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REFERENCE:

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P 604.439.0922
F 604.439.9189

DATE:	NOVEMBER 30, 2018	
DRAWN BY: C.T.	APPROVED BY: M.J.K.	REVIEWED BY: D.K.
SCALE:	AS SHOWN	

ANCHOR DETAIL

FILE NO.: 12376-C
DWG NO.: G-1

REVISIONS:
A.
B.
C.

NOV 30 2018

1.0 GENERAL

1.1 In these Notes, the Engineer is GeoPacific Consultants Ltd.

1.2 These Notes must be read in conjunction with the design Drawings.

1.3 The work described and shown involves near vertical excavated slopes or structure using a combination of shotcrete and ground anchors. All slopes shall be covered with secured polyethylene sheeting to prevent erosion.

1.4 The anchors will be installed in ground around the site and the actual soil and groundwater conditions must be assumed.

1.5 The grouted anchor lengths required to resist the design loads are based on the assumed conditions. The capacity of the anchors will be confirmed at the beginning of the contract and may be lengthened or shortened.

1.6 Some utilities, foundations and structures which may affect the installation procedures and techniques are noted on the Drawings.The Contractor shall confirm the locations and condition of ALL man-made elements which may be damaged because of the anchored shotcrete operations. It is the Contractor's responsibility to install the anchored shotcrete in the actual site conditions encountered.

Elements which may, in the opinion of the Contractor, be damaged by the anchored shotcrete operations must be reported to the Engineer well in advance of the work to take place.

1.7 These documents are based on architectural, structural and survey Drawings provided. It is the Contractor's responsibility to verify all dimensions and report discrepancies to the Engineer.

1.8 The Contractor shall schedule and co-ordinate the work to satisfy the reasonable requirements of adjacent Owners and Tenants who shall be given sufficient Notice before carrying out work which may affect their property.

1.9 The Contractor shall erect and maintain a secure closed hoarding around the site for the safety of all persons in the vicinity of the site.

1.10 The Contractor shall inspect the slopes and the support to the slopes and structures daily and shall immediately report any potentially damaging movement or deterioration to the Engineer by telephoning 604-439-0922.

2.0 MATERIALS

2.1 ANCHOR BAR:

The anchors shall be installed in minimum 75 mm (3 inch) diameter holes which shall be drilled, unless otherwise approved in advance by the Engineer. Anchor capacity is dependant upon installation techniques and the drilling equipment and methods shall be subject to the Engineer's approval.

Drilling techniques shall produce a hole which is free of debris and ensure continuous support of the hole and shall not erode or disturb soil around the hole.

2.2 Anchor tendons shall be as shown on the design drawings.

Anchorage equipment couplings and any necessary wedges washers and plates shall be in accordance with the tendon manufacturer's specifications and requirements.

Minimum anchorage length ("fixed" length) and stressing length ("free" length) are shown on the Drawings.

2.3 Grout in the anchorage shall be a prior-approved non-shrink cementitious material mixed with a minimum compressive strength of 5 MPa in 24 hours and 35 MPa in 28 days.

2.4 Shotcrete shall be reinforced with 102 x 102 MW13.3/13.3 (4"x4"-8/8) welded wire mesh as shown on the Drawings. Steel shall have a minimum yield strength of 450 MPa (65 ksi) and shall be in accordance with ASTM A497.

2.5 All shotcreting shall be carried out in accordance with ACI 506 : "Specifications for Materials Proportioning and Application of Shotcrete"

2.6 Shotcrete shall have a minimum compressive strength of 5 MPa in 24 hours and 30 MPa in 28 days. The Engineer may require test panels to be prepared by the Contractor so they can be cored by others to confirm the shotcrete strength. The Contractor shall co-operate with the independent testing laboratory appointed by the Owner for this purpose.

3.0 INSTALLATION

3.1 Hollow Core Bar Installation (if required)

Set the bar on an appropriate drill rig. Start pumping the grout to assure that grout will exit drill bit.

Proceed with rotary drilling and flushing approx. three feet per min (depending on ground condition). Rotation speed should be approx. 60 to 120 RPM. To achieve higher friction values, advance and retract the bars several times for each 3.0 m (10 feet) length of bar installed in the bond zone.

The grout should be applied CONTINUOUSLY during drilling. A grout pump with at least 60 l/min volume and minimum 2 MPa (300 psi) pressure capacity (preferably 10 MPa, 1500 psi) should be used.

Refer to the manufacture's specifications and recommendations for more detail.

3.2 Anchors and shotcrete shall be installed in sequence and stages to maintain stability of the excavation. Excavation of soil from the site shall also take place in stages. Stages shall not exceed 1.8 m (6 feet) vertical.

The Contractor may remove all soil within any mass excavation Stage before anchors in that Stage are installed but further excavation shall not take place until all anchored shotcrete in that Stage is installed and approved by the Engineer.

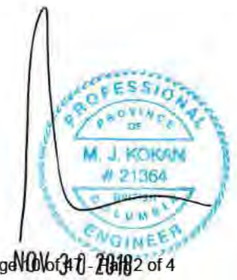
The mass excavation for any Stage does not include a perimeter berm with a minimum top width of one metre and a side slope of 1 horizontal to 1 vertical.

Ground conditions may locally require a wider berm, flatter slopes and/or other slope protection measures including covering or short-term temporary support.

The perimeter berms in any stage shall be excavated in staggered panels. THE MAXIMUM WIDTH OF A PANEL SHALL BE THE HORIZONTAL SPACING OF THE ANCHOR PLUS 0.6 M (2 FEET). This panel width may be INCREASED OR DECREASED by the Engineer's agreement, in writing, BEFORE increasing the panel width.

No adjacent panels shall be excavated concurrently and no more than 1/3 of the panels shall be excavated concurrently. In addition no panel shall be excavated into the berm until at least 24 hours after that panel anchor has been grouted.

Anchors and shotcrete may be installed concurrently in different panels. Anchors shall be installed at right angles to the property lines on plan and within 2.5 degrees of the declination shown on the Drawings except with the prior approval of the Engineer.



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REFERENCE:	GEOPACIFIC VANCOUVER KAMLOOPS CALGARY 1779 W. 75th Avenue, Vancouver, B.C. V6P 6P2 P 604.439.0922 F 604.439.9189	DATE: NOVEMBER 30, 2018 DRAWN BY: C.T. / APPROVED BY: M.J.K. / REVIEWED BY: D.K. SCALE: AS SHOWN	GENERAL NOTES	FILE NO.: 12376-C DWG. NO.: G-2 (SHEET 1 OF 2)	REVISIONS: A. B. C.

ORIGINAL PAPER SIZE 11"x17"

3.3 Immediately following excavation of the soil berm in a panel the excavated face shall be trimmed back to the required line and mesh reinforcement shall be fixed to the soil to ensure the minimum specified shotcrete cover. Shotcrete shall be applied without delay to thicknesses shown on the Drawings.

Shotcrete panels shall be kept moist to aid curing by spraying with water and covering with sacking or polyethylene sheeting.

Sufficient wire mesh reinforcement shall be installed to provide a full strength overlap with adjacent panels. This overlap shall not be less than 200 mm (8 inch).

The end surfaces of panels shall be thoroughly cleaned with compressed air to ensure a full strength bond when adjacent panels are shotcreted.

3.4 Drains to relieve groundwater pressure shall be installed through the shotcrete. Drains shall be a minimum of 50 mm (2 inches) diameter and at normal 3.0 m (10 feet) centres horizontally and 1.5 m (5 feet) centres vertically. The Contractor shall install filters in drains as fines are being removed with the water.

Additional special drains may be required where water seeps are noted. This special drains shall consist of minimum 50 mm (2 inches) diameter perforated ABS pipe installed within 75 mm (3 inches) diameters holes drilled 5 degrees UPWARDS from the 3 metres (10 feet) measured from the face of the shotcrete. These special drains may be required to be filtered with fine sand or gravel or filter fabrics.

3.5 Anchors shall be tensioned as soon as practicable but no sooner than 24 hours after the construction of the applicable shotcrete panel. Anchors shall be tensioned and tested as follows:

3.5.1 Apply a proof load of 1.33 times the lock-off load for two minutes. Monitor the load in the anchor. If the reduction in load is less than 2.5 percent of proof load reduce the load to lock-off load and lock the working load into the anchor.

3.5.2 If the anchor does not hold at least 133 percent of lock-off load for two minutes the Engineer must be informed. Further testing in the presence of the Engineer will required as follows:

Load the anchor in 22 kN (5 kip) increments to 130.5 percent of lock-off load. Hold each increment for 5 minutes except at maximum load when the load shall be maintained for 100 minutes. The increase in length of the anchor shall be measure at the start and end of each load increment except at maximum load when the extension shall be measured at 5 minutes intervals.

This information shall be utilized by the Engineer to deduce the utilized anchor length and to assess the creep characteristics.

Anchors which creep more than 2 mm (0.08 inch) per log cycle of time will not be accepted. The Contractor shall install replacement anchors at the Contractor's expense.

4.0 SHOTCRETE REMOVAL/ANCHOR DETENSIONING

4.1 All excavation and support works within the CITY OF VANCOUVER shall be in strict accordance with the City's requirements.

4.2 No part of the anchor system shall remain in place within 1.5 m (5 feet) of final grade. Anchors 1.5 m (5 feet) below final grade shall be detensioned or fully grouted when no longer required in the opinion of the Engineer.

4.3 No shotcrete shall remain in place within 1.5 m (5 feet) of final grade. A bond breaker must be installed between blind-formed foundation walls and shotcrete on city property to allow for shotcrete removal.

5.0 BACKFILLING ON AND ADJACENT TO CITY PROPERTY

5.1 Backfilling on and adjacent to City property must be in accordance with the City's backfill specifications, with the City's backfill specifications, "Street Restoration Manual" dated AUGUST 18, 2008.

5.2 Backfill Containment dams will be required at excavation corners where excavation to be backfilled against City property.

6.0 REQUIRED INSPECTIONS

6.1 The following are the MINIMUM inspections which are required by the Geotechnical Engineer. The Contractor is responsible for informing the Geotechnical Engineer that the Work is ready for these inspections. The Contractor shall be liable for any loss caused by failure to inform the Geotechnical Engineer that the Work is ready for inspection.

1. 2 days before work commences on site.
2. 1 day before the anchors are detensioned.
3. 2 days before backfilling commences.
4. 1 day before shotcrete removal.

6.2 Daily Inspection is required during installation of anchors, and full time inspection is required during anchor testing.

7.0 CONTRACTOR QUALIFICATION

7.1 Temporary works and shoring installation is highly sensitive to processes including sequence of installation, quality and quantity of materials used, monitoring of the works and other factors. Consequently a high degree of skill and professionalism is required for its successful implementation. As a result, all contractors considered for tender of the shoring work described in the Design Drawings must be approved by the Engineer in advance of tender. The work must be carried out only by a shoring contractor with experience and expertise in shoring construction. The contractors experience and expertise must be with projects of similar size and scope to that shown in the Design Drawings. The following shoring contractors are permitted to undertake the work:

- Malcon Canada
- Southwest Contracting
- Bel Pacific Excavation & Shoring
- Vancouver Shotcrete
- Power Shotcrete Shoring LTD.
- Mainland Excavation & Shoring ltd.

7.2 The preceding list does not express or imply any guarantee or warranty of the contractor's performance. It is the responsibility of the contractor to undertake the work shown on the Design Drawings.

7.3 Shoring contractors other than those listed above may be considered by the Engineer only with submission of references and qualifications for at least 10 projects of similar size and scope. GeoPacific reserves the right to accept or reject the qualifications of any shoring contractor.

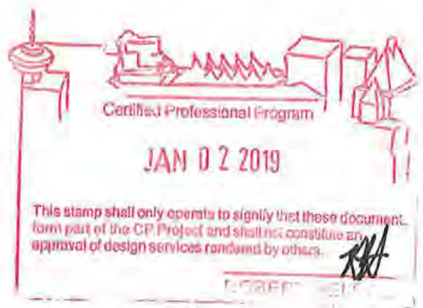
NOTES:

1. The excavation support design is based on the locations of adjacent structures and utilities which have been supplied. The Contractor shall confirm the locations and elevations of all foundations and utilities which may be affected by the work and raport any discrepancies to GeoPacific Consultants Ltd. (Tel.: 439-0922)
2. All slopes shall be covered with secured polyethylene sheeting to prevent erosion.
3. The extent of the excavation shall be based on the Architectural and Structural Drawings. The Contractor shall confirm the size of the excavation required by the basement and report any discrepancy with these Drawings to GeoPacific Consultants Ltd.
4. The Contractor must obtain prior permission in writing to carry out any work on adjacent private property.
5. The Contractor shall inform GeoPacific Consultants Ltd. of any surcharge loads which will be within half the height of the excavation from the top of the excavation so that the support system can be modified to support the additional loads. The Contractor shall also inform GeoPacific if and when any groundwater seepages occur which may require additional special drains as outlined in Note 3.4, Drawing G-2.
6. The ground conditions must be confirmed by GeoPacific Consultants Ltd. when the excavation is 4 feet deep. The Contractor is responsible for ensuring that GeoPacific personnel inspect the site.

DRAWING LIST:

SITE PLAN---------- G-S1
ELEVATIONS, SECTIONS---------- G-S2A, G-S2B, G-S3A, G-S3B, G-S4, G-S5A, G-S5B

GENERAL SHOTCRETE/UNDERPINNING AND ANCHOR DETAILS---------- G-1
GENERAL NOTES---------- G-2 (SHEET 1 TO 2)
TEMPORARY SEDIMENT CONTROL FACILITY--- G-ESC1, G-ESC2, G-ESC3 & G-ESC4



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REFERENCE:	GEOPACIFIC VANCOUVER KAMLOOPS CALGARY 1779 W. 75th Avenue, Vancouver, B.C. V6P 6P2 P 604.439.0922 F 604.439.9189	DATE: NOVEMBER 30, 2018	GENERAL NOTES	FILE NO.: 12376-C	REVISIONS: A. B. D.
		DRAWN BY: C.T. / APPROVED BY: M.J.K. / REVIEWED BY: D.K.		DWG NO.: G-2 (SHEET 2 OF 2)	
		SCALE: AS SHOWN			

NOV 30 2018

GEOPACIFIC
VANCOUVER KAMLOOPS CALGARY

P 604.439.0922
F 604.439.9189
geopacific.ca
1779 W 75th Ave.
Vancouver, B.C. Canada V6P 6P2

Onni Group
300 - 550 Robson Street
Vancouver, BC
V6B 2B7

June 28, 2018
File #: 12376-C

Attention: Court Brown

Re: Geotechnical Investigation Report: Pearson Dogwood Site – Parcel C
500 & 650 W 57th Avenue, Vancouver, B.C.

1.0 INTRODUCTION

We understand that Onni Group is planning to proceed with the re-development of the above referenced site. Based on the Pearson Dogwood Policy Statement (dated February 2014), and preliminary design drawings shown in the proposed rezoning application (2017) the re-development of the site is expected to include a 27 storey tower with a 7 level podium and 4 levels of common underground parking. We anticipate that reinforced concrete construction will be employed for the entire development. No detailed structural information for the development has been provided at this time, however, we expect heavy loading for the proposed development.

This report presents our recommendations for the design and construction of the proposed development and temporary excavations, based on findings from our geotechnical investigation and experience in the immediate area. This report has been prepared exclusively for Onni Development for their use and the use of others on their design team, as well as for the City of Vancouver for use in the development and re-zoning process.

2.0 SITE DESCRIPTION

The site is located in the south Cambie area of Vancouver and encompasses several city blocks. The site is divided into a total of 9 parcels which are expected to be constructed in 5 phases. The site is bounded by West 57th Avenue to the north, Cambie Street to the east, West 59th Avenue to the south and Heather Street to the west. Currently, the site is improved with two care facilities which consists of single storey buildings, paved pathways, parking areas, and open green spaces. Parcel C is located along 57th Avenue, bounded by parcels F, D and B to the west, east and south respectively. The site gently slopes from north west to south east.

The site location relative to the surrounding improvements is shown on our Drawing No. 12376-C-01, following the text of this report.

3.0 SITE INVESTIGATION

GeoPacific Consultants conducted a preliminary geotechnical investigation of the Pearson Dogwood site on July 28 and 29, 2014. At this time, a total of 16 solid-stem auger holes, labelled TH14-01 through TH14-16, were drilled to depths between 4.6 and 12.2 metres below existing site grades. A supplementary geotechnical field investigation of the Parcel E site was completed on May 11, 2018 to install a monitoring well for continuous groundwater monitoring below the anticipated parkade depths and to provide additional geotechnical data in the immediate vicinity of the development. At the time of this investigation, one solid-stem auger hole, TH18-03 was drilled to a depth of 11.6 metres below grade (mbg) and a well with a 3 m screen was installed to a depth of 11.6 mbg. This drilling was completed using a truck-mounted drill rig, supplied and operated by Southland Drilling Ltd. of Burnaby, B.C. The test holes were located, supervised and logged by a member of our geotechnical staff.

Prior to our investigation, a BC one call was placed and a member of our utility locate staff was on site to clear the test location of buried services. The test hole was backfilled and sealed in accordance with provincial abandonment requirements following classification, sampling and logging.

The test hole log is presented as Figure A.01 in Appendix A. The test hole logs from our preliminary geotechnical investigation are presented in Appendix B. The approximate locations of the test holes shown on our Drawing 12376-C-01, following the text of this report.

4.0 SUBSURFACE CONDITIONS

4.1 Soil Conditions

The soil classification used herein is based on the "Unified Soil Classification System", except as otherwise noted.

The general geology of the region under investigation is described as Vashon drift and Capilano Sediments of Pleistocene age according to the Geological Survey of Canada map 1486A. The Vashon drift is characterized by lodgment and minor flow till with lenses and interbeds of substratified glaciofluvial sand to gravel.

The subsurface conditions at our test hole locations was noted to consist of a silty sand and gravel fill to depths of 0.33 mbg, followed by a firm to stiff silt layer, extending to a depth of 2.7 mbg, overlaying a very dense glacial till. The till generally consists of dense to very dense silty sand to sand and gravel. Our experience in the area as well as the drilling conditions on-site indicates that cobbles and boulders may be present within glacial till. This glacial till layer was noted to extend beyond the termination depths of our test hole.

The Vancouver's Old Streams map, published by the City of Vancouver, shows a buried stream approximately aligned at the center of the site that trends south east through the property. Our test hole did not encounter stream sediments in Parcel C.

4.2 Groundwater Conditions

Based on observations at the time of drilling as well as our previous work done at the site, some groundwater is expected at 5 - 7 mbg. Perched groundwater located above the till is expected to develop in all areas of the site within the surficial fills and sand or silt layers overlying the glacial till during wetter periods of the year.

Discrete zones of discontinuous seepage are common within the local glacial till. These zones produce moderate to heavy seepage until drained and light to negligible seepage thereafter. We expect that the anticipated seepage may be handled by conventional sumps and sump pumps

5.0 DISCUSSION

5.1 General Comments

As noted above, the re-development of this parcel is expected to include a 27 storey tower with an adjacent 7 level podium over 4 levels of common underground parking. We anticipate that reinforced concrete construction will be employed for the entire development. No detailed structural information for the development has been provided at this time, however, we expect heavy loading for the proposed development.

Based on the observed soil conditions at the site, we expect that the proposed structures may be founded on conventional strip and pad foundations bearing on the very dense glacial till noted at our test hole location. Where foundations cannot be constructed on unweathered glacial till they should be placed on engineered fill, as defined in Section 6.1. Our foundation recommendations are provided in Section 6.2.

No special ground treatment is anticipated provided that all foundations are constructed on the undisturbed, very dense glacial till.

Any below grade construction, such as for building parkades, will likely be at or near adjacent property lines on the north side and in close proximity to adjacent parcels to the east, south and west. As a result, vertical shoring is expected to be required for the entire excavation. Open cut excavations should be considered where there is sufficient room to do so. Our temporary excavation and shoring recommendations are provided in Section 6.6.

We expect that normal pumped sumps would be sufficient to control initial perched groundwater flows and seepage from discrete sandy zones within the glacial till seepage during excavation A conventional drained cavity could be constructed around the below grade construction.

Our experience in this area of Vancouver indicates that large cobbles or boulders may be present within the glacial till. We expect that splitting or blasting may be required to remove any large boulders that are encountered which cannot be readily removed with the on-site excavation equipment.

The subsurface soils are not expected to be prone to liquefaction or other forms of ground softening under the design earthquake defined under the the 2014 City of Vancouver Building Bylaw (VBBL).

We confirm, from a geotechnical point of view, that the proposed re-development is feasible provided the

recommendations outlined in Sections 6.0 are incorporated into the overall design.

6.0 RECOMMENDATIONS

6.1 Site Preparation for Buildings

We expect that the depth of stripping at this site will be dictated by proposed foundation elevations rather than the condition of the soils present on-site. However, prior to construction of foundations and floor slabs all existing structures, vegetation, topsoil, fill, organic material, debris, refuse, and loose or otherwise disturbed soils must be removed from the construction areas to expose a subgrade of *very dense glacial till*.

Any grade reinstatement under footings bearing on glacial till should be done with lean mix concrete with an unconfined compressive strength of 5 MPa at 28 days. In areas not supporting foundations, grade reinstatement can be done with "engineered fill". In the context of this report, "engineered fill" is generally 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 98% of the ASTM D698 (standard proctor) maximum dry density at a moisture content that is within 2% of optimum for compaction. The glacial till subgrade may be sensitive to changes to moisture content. Therefore, the excavation subgrade should be graded to prevent ponding of water at footing locations. Any water softened soil must be excavated to expose a subgrade of undisturbed very dense glacial till.

6.2 Building Foundations

Based on the anticipated founding depth and the test hole information, we envision that the new building foundations will be constructed on a dense glacial till subgrade.

Pad and strip footings founded on the undisturbed, very dense glacial till can be designed at a Serviceability Limit States (SLS) bearing pressure of 600 kPa and at a factored Ultimate Limit States (ULS) bearing pressure of 900 kPa for use under short term transient loading such as those induced by wind or earthquakes. Footings should not be less than 450 mm in width for strip footings and not less than 600 mm for pad footings. All footing subgrades must be immediately protected using a thin layer of lean mix concrete.

Foundations which are placed on "engineered fill", as defined in Section 6.1, may be designed on the basis of a SLS bearing pressure of 120 kPa and a factored ULS bearing pressure of 180 kPa for strip and pad footings.

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. The foundation should be buried at least 460 mm for frost protection.

We expect that the settlement of footings designed as recommended should be within the normally acceptable limits of 25 mm maximum and up to about 20 mm differential over a 10 metres span.

Adjacent foundations constructed at differing elevations should be offset from each other by a minimum distance of twice the difference in elevation (2H:1V). For example, two foundations separated by 1.0 m in

elevation should be offset horizontally from each other by a minimum distance of 2.0 m as measured from the inside edges of those foundations. Foundations constructed within 2H:1V of each other may impose additional vertical and horizontal forces on lower foundations, columns and/or foundation walls. GeoPacific should review foundation layouts which do not achieve the minimum 2H:1V offset.

The foundation subgrade must be reviewed by the geotechnical engineer at the time of construction.

6.3 Slab-On-Grade Floors

In order to provide suitable support for slab-on-grade floors we recommend that any fill placed under the slab should be "engineered fill" described in section 6.1 above.

Floor slabs should be underlain by a minimum of 150 mm of 19mm clear crushed gravel fill to inhibit upward migration of moisture beneath the slab. The crushed gravel fill should be compacted to a minimum of 98% of the ASTM D1557 (modified proctor) maximum dry density at a moisture content within 2% of optimum for compression. A moisture barrier should underlie the slab directly above the free draining granular material. The 19mm clear crush gravel layer should be hydraulically connected to the perimeter drainage system to facilitate the removal of any water which may accumulate below the floor slab.

Compaction of the slab-on-grade fill must be reviewed by the geotechnical engineer.

6.4 Foundation Drainage

A perimeter drainage system will be required for the below grade portion of any structure to prevent the development of water pressure on the foundation walls.

We recommend for preliminary design of the foundation drainage system that the mechanical or civil designer utilize an inflow rate of 20 litres/minute, assuming a 4000 m^2 parkade area. Flow rates should be confirmed at the time of excavation and adjusted, if necessary.

Any at grade structures which are constructed at least 200mm above finished outside elevations and are graded to direct surface water away from the building into the site storm water system do not require a perimeter drainage system.

6.5 Seismic Design of Foundations

The subgrade conditions underlying the site may be classified as Site Class C as defined in Table 4.1.8.4.A of the 2014 VBBL. Peak ground accelerations on firm ground for the approximate site location is 0.48 g (National Resource Canada, Site Coordinates: 49.218 degrees North, 123.119 degrees West).

6.6 Temporary Excavations

As mentioned above any construction below grade, will likely be at or near adjacent property lines on the north side and adjacent parcels to the east, south and west. As a result, the excavation should be shored using a conventional anchored shotcrete shoring system. It is our opinion that the natural soils are sufficiently dense and strong that vertical cuts may be supported with the use of shotcrete shoring with

sufficiently dense and strong that vertical cuts may be supported with the use of shotcrete shoring with pre-tensioned grouted soil anchors, which is the most economical system available in Greater Vancouver. Hollow core (self-drilling) anchors should be anticipated in sandy zones within the excavation.

Some excavation induced ground movements are unavoidable, irrespective of the shoring method used. Given the depth of excavation contemplated for this project, we expect movements at the perimeter of the excavation to be in the order of 15 to 20 mm at the excavation face, decreasing to 7 to 10 mm at 3 metres away from the excavation face. Structural damage is not common at this magnitude of movement, though some minor cosmetic issue may have to be addressed.

Our observations during our site investigation as well as our experience in this area indicate that cobbles and boulders may be present within the native soils. Cobbles and small boulders can typically be removed with conventional excavation equipment. However, large may require splitting/blasting to facilitate their removal from the site.

Light seepage should be expected during the wetter months due to the formation of perched water tables in the surficial soil overlying the lower permeability glacial till. Light seepage is expected from the glacial till. Temporary moderate to heavy seepage should be expected from any sand to gravelly sand seams present within the glacial till until they drain. We expect that inflows may be handled with sumps and sump pumps.

Shoring installation requires review at the time of tie back anchor installations and trimming of panels, prior to shotcrete applications and during tensioning of the tie back anchors.

GeoPacific can provide an excavation/shoring design upon request. Installation of anchored shotcrete shoring must be reviewed by the geotechnical engineer.

6.7 Lateral Pressure on Foundation Walls

As indicated above that the propose development may have a several levels of below grade construction. The earth pressure on below grade walls depends upon a number of factors including the backfill material, surcharge loads, backfill slope, drainage, rigidity of the basement or retaining wall, presence of shoring, and method of construction including sequence and degree of compaction. For a partially restrained basement wall designed for static pressure a pressure distribution of 4.5H (kPa) triangular, where H is the height of the restrained soil in metres, should be employed.

Dynamic loading induced by an earthquake should be added to the static loads and should be taken as 2.5H (kPa) inverted triangular.

We have assumed that a free draining back fill will be used behind the foundation 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 above assume that no water pressure will be generated behind the walls.

Backfill materials, shotcrete removal and procedures on or adjacent to the City properties should be in accordance with the current edition of "The City of Vancouver Street Restoration Manual".
All earth pressures are based upon unfactored soil parameters and are assumed to be unfactored loads.

6.8 Utility Design and Installation

Site utilities will be required beneath the slabs-on-grade. The design of these systems must consider the locations and elevations of the foundations. The service trenches and excavations required for the installation of the underground pipes, vaults and/or manholes must be located outside of a 1.5:1 (H:V) slope measured downward from the edge of adjacent foundations.

All excavations and trenches must conform to the latest Occupational Health and Safety Regulation supplied by the Worker Compensation Board of British Columbia. Any excavation in excess of 1.2 metres in depth requiring man-entry must be reviewed by a professional geotechnical engineer.

7.0 DESIGN REVIEWS AND CONSTRUCTION INSPECTIONS

The preceding sections make recommendations for the design and construction of the proposed re-development of the Pearson Dogwood site in Vancouver, B.C. We have recommended the review of certain aspects of the design and construction. It is important that these reviews are carried out to ensure that our intentions have been adequately communicated. It is also important that any contractors working on the site review this document prior to commencing their work.

It is the responsibility of the contractors working on-site to inform GeoPacific a minimum of 48 hours in advance that a field review is required. In summary, reviews are required by the geotechnical engineer for the following portions of the work:

1. Stripping	Review of stripping depth.
2. Excavation	Review of temporary cut slopes.
3. Shoring	Review of shoring installation and anchor testing.
4. Engineered Fill	Review of fill materials and compaction.
5. Foundation	Review of foundation subgrade.
6. Slab on-grade	Review of subgrade and underslab fill materials and compaction.
7. Backfill	Review of backfill materials and placement against foundation walls.

8.0 CLOSURE

This report has been prepared exclusively for Onni Group for the purpose of providing geotechnical recommendations for the design and construction of the proposed re-development of the Pearson Dogwood site. The report remains the property of GeoPacific Consultants Ltd. and unauthorized use of, or duplication of, this report is prohibited.

We are pleased to be of assistance to you on this project and we trust that our comments and recommendations are both helpful and sufficient for your current purposes. If you would like further details or would like clarification of any of the above, please do not hesitate to call.

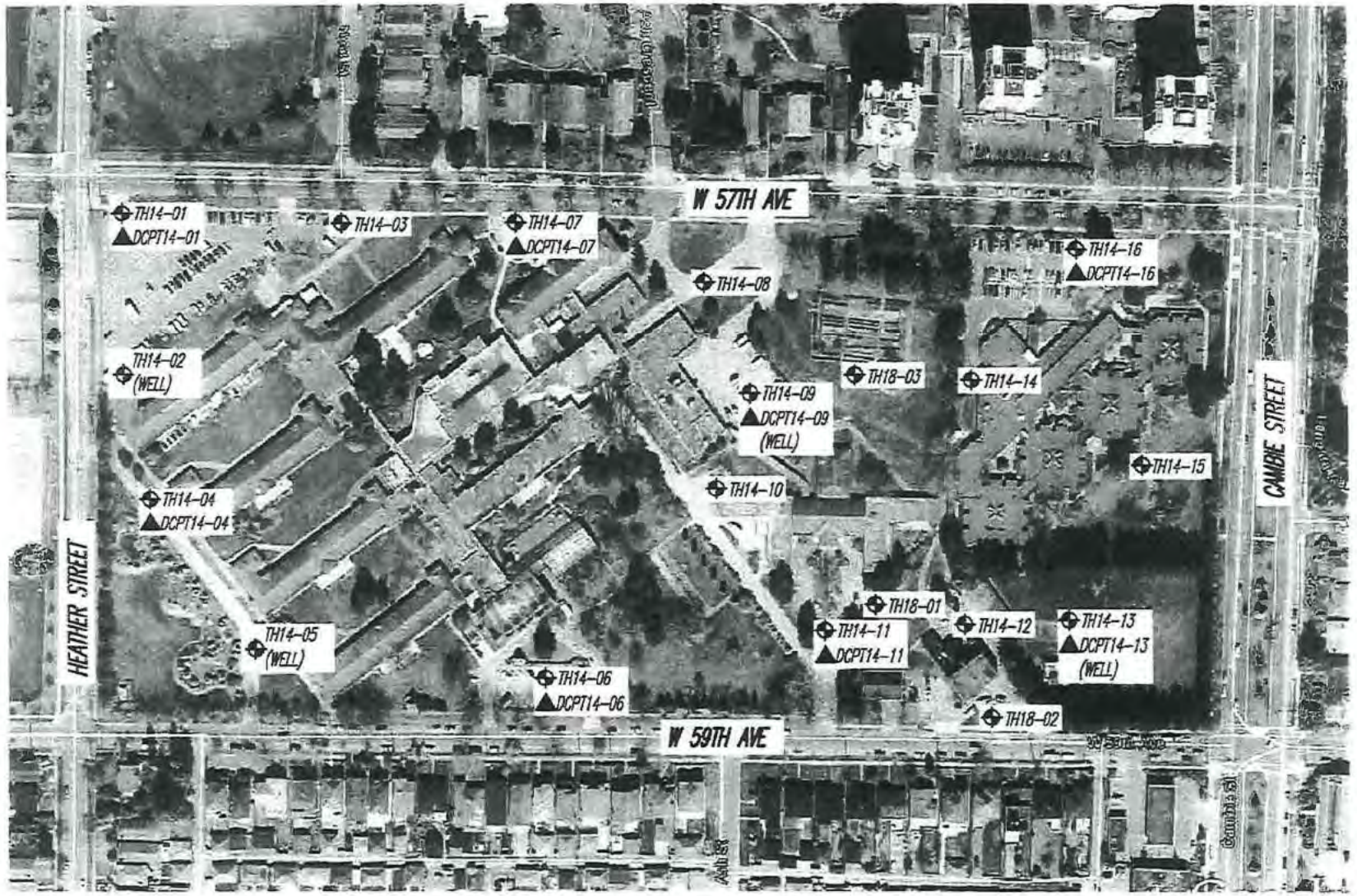
For:
GeoPacific Consultants Ltd.

Reviewed By:

JUN 2 9 2018

Daniel Kokan, B.A.Sc., E.I.T.
Geotechnical Engineer-in-Training

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



LEGEND:

TH14-# - TEST HOLE (TH) LOCATION

DCPT14-# - DYNAMIC CONE PENETRATION TEST (DCPT) LOCATION

SITE PLAN

SCALE = 1:2500

REFERENCE:

GEOPACIFIC
VANCOUVER KAMLOOPS CALGARY

1779 W. 75th Avenue
Vancouver, B.C. V6P 6P2
P 604.439.0922
F 604.439.0189

DATE: MAY 11TH, 2018
DRN BY: D.K. APP'D: M.J.K.
SCALE: AS SHOWN

PEARSON DOGWOOD SITE

VANCOUVER, B.C.

TEST HOLE PLAN

FILE NO.: 12376-C
DWG. NO.: 12376-C-01
REVISIONS: 1 2 3

APPENDIX A – 2018 TEST HOLE LOGS

Test Hole Log: TH18 - 01

File: 12376 - E
Project: Proposed Mixed Use Development
Client: ONNI
Site Location: 500 & 650 W 57th, Vancouver

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

Depth (ft / m)	Symbol	SOIL DESCRIPTION (INFERRED PROFILE)	Depth (m)/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 / 0		Ground Surface					
0		***Sand (FILL)***	0.0				
1		***Sandy Silt*** Brown sandy silt, trace gravel, trace cobbles, stiff to very stiff, dry to moist					
2 / 1		***Silt*** Brown silt, trace sand, stiff to very stiff, dry to moist		17.4%			
6 / 2		***Sand*** Brown sand, some silt, trace gravel, trace cobbles, compact, dry to moist	1.8	10.5%			
10 / 3		***Silt and Sand (TILL)*** Grey silt and sand, some gravel to gravelly, some cobbles, compact to dense From 10' to 15': Dry From 15' - 17.5': Wet	3.0	9.1%			15' - Perched Groundwater
18 / 5		***Silty Sand and Gravel (TILL)*** Grey silty sand and gravel, trace cobbles, dense, dry	5.3	10.7%			
20 / 6		***Sand (TILL)*** Grey sand lens, compact, wet	6.1	10.6%			
23 / 7		***Silty Sand and Gravel (TILL)*** Grey silty sand and gravel, trace cobbles, dense to very dense, dry	6.9	10.5%			
26 / 8							
29 / 9							
30							

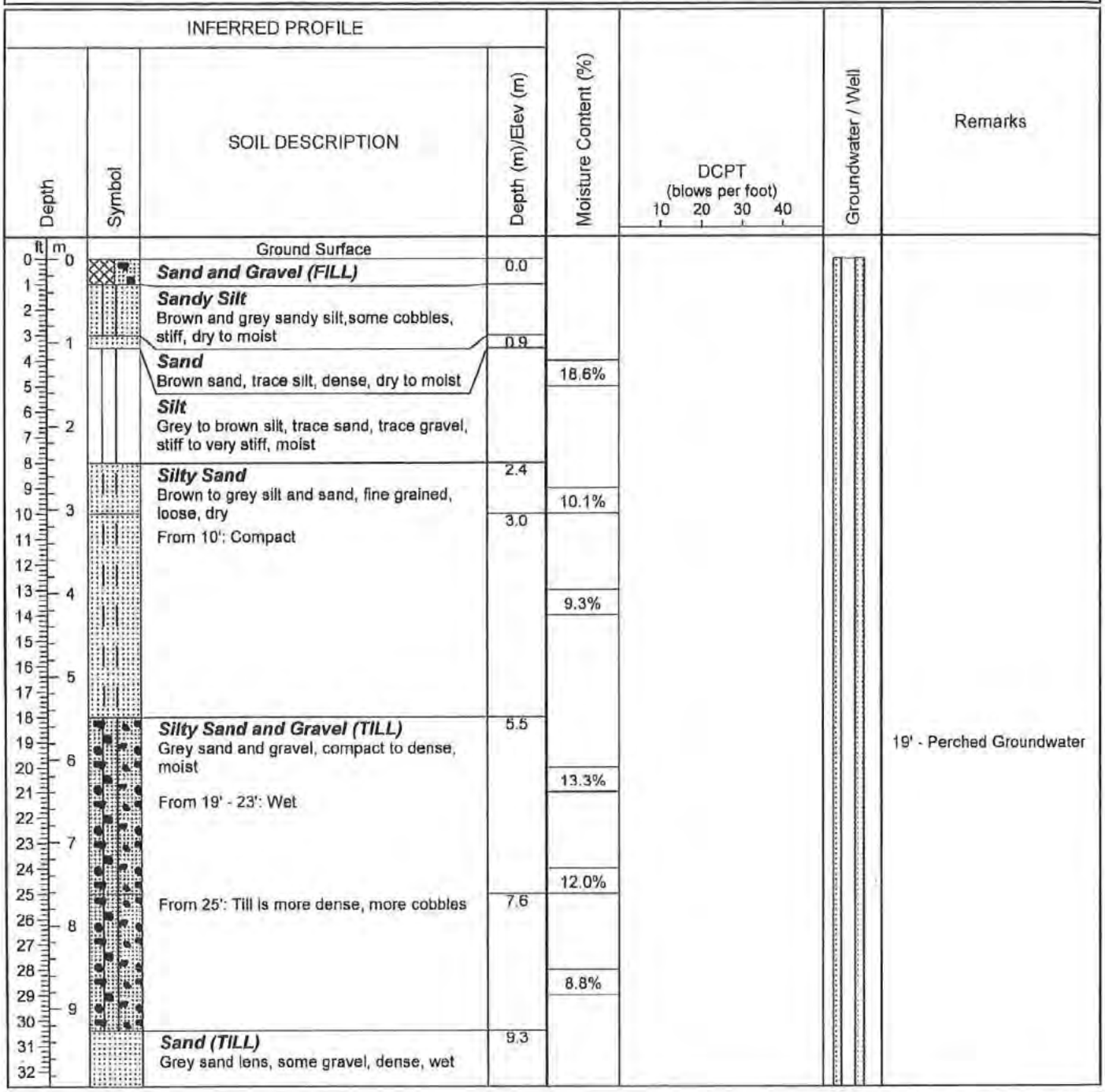
Logged: DC
Method: Solid Stem Truck Mounted Auger Drilling
Date: May 11th, 2018

Datum: Exisiting Ground Surface
Figure Number: A:01
Page: 1 of 2

Test Hole Log: TH18-02

File: 12376 - A
Project: Proposed Mixed Use Development
Client: ONNI
Site Location: 500 & 650 W 57th, Vancouver

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



Logged: DC
Method: Solid Stem Truck Mounted Auger Drilling
Date: May 11th, 2018

Datum: Exisiting Ground Surface
Figure Number: A.01
Page: 1 of 2

Test Hole Log: TH18-02

File: 12376 - A
Project: Proposed Mixed Use Development
Client: ONNI
Site Location: 500 & 650 W 57th, Vancouver

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

Depth	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
33 10							
34 35 36 11		***Silty Sand and Gravel (TILL)*** Grey silty sand and gravel, dense to very dense, dry	10.1				
37 38 39 12							
40 41 42 13							
43 44 45		From 45': Some dark grey silt present	13.7				
46 14 47 48 49 15							
50 51 52 16							
53 54 55							
56 17 57 58 59 18							
60 61		End of Borehole	18.6				
62 19 63 64							

Logged: DC
Method: Solid Stem Truck Mounted Auger Drilling
Date: May 11th, 2018

Datum: Exisiting Ground Surface
Figure Number: A.01
Page: 2 of 2

Test Hole Log: TH18-03

File: 12376 - C
Project: Proposed Mixed Use Development
Client: ONNI
Site Location: 500 & 650 W 57 Ave, Vancouver

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

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 / 0		Ground Surface					
0 / 0		***Silty Sand and Gravel (FILL)*** Dark grey - brown silty sand and gravel, compact, moist	0.0		16, 7, 7		
3 / 1		***Sandy Silt*** Rusty brown sandy silt, trace gravel, firm from 2' to 6', stiff from 6', moist	0.6		31, 45, 48, 42, 41, 48 Refusal		
9 / 3		***Silty Sand and Gravel (TILL)*** Brown-grey silty sand and gravel, dense to very dense, dry	2.7	12.5%			
15 / 4		Grey at 15'	4.4	8.7%			
38 / 11		End of Borehole	11.6				

Logged: DK
Method: Solid Stem Truck Mounted Auger Drilling
Date: May 14, 2018

Datum: Exisiting Ground Surface
Figure Number: A.01
Page: 1 of 1

Test Hole Log: TH18-03

File: 12376 - C
Project: Proposed Mixed Use Development
Client: ONNI
Site Location: 500 & 650 W 57 Ave, Vancouver

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

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 / 0		Ground Surface					
0–2 / 0–0.6		***Silty Sand and Gravel (FILL)*** Dark grey - brown silty sand and gravel, compact, moist	0.0		16, 7, 7		
2–9 / 0.6–2.7		***Sandy Silt*** Rusty brown sandy silt, trace gravel, firm from 2' to 6', stiff from 6', moist	0.6		31, 45, 48, 42, 41, 48, Refusal		
9–38 / 2.7–11.6		***Silty Sand and Gravel (TILL)*** Brown-grey silty sand and gravel, dense to very dense, dry	2.7	12.5%			
		Grey at 15'	4.4	8.7%			
38 / 11.6		End of Borehole	11.6				

Logged: DK
Method: Solid Stem Truck Mounted Auger Drilling
Date: May 14, 2018

Datum: Exisiting Ground Surface
Figure Number: A.01
Page: 1 of 1

APPENDIX B – 2014 TEST HOLE LOGS

Test Hole Log: TH14-01

File: 12376
Project: Preliminary Geotechnical Investigation Report
Client: Coastal Health
Site Location: West 57 to 59 Ave., Cambie to Heather St., Vancouv

GeoPacific Consultants Ltd.
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-430-0822 Fax604-430-0189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 / 0		Ground Surface					
		Asphalt (50mm)	0.0				
1		**Fill (Sand and Gravel)**					
2		**Silt and Sand (Glacial)** Compact to dense SAND and SILT, some of gravel, grey brown.			>50		
3 / 1		@0.3m brown, moist.			35		
4		@1m become dense SAND and SILT till, some of gravel, occ, cobble, brown		13.7	>50		
5		@1.5m become grey.					
6 / 2							
7							
8							
9				7.7			
10 / 3		@3m trace to some of moisture.					
11							
12							
13 / 4							
14				8.6			
15		@4.5m uniform, grey, some moisture.				▼	4.5m assumed water table.
16 / 5							
17							
18							
19							
20 / 6				8.7			
21		End of Borehole	6.1				

Logged: AM
Method: Solid Stem Auger
Date: July 28-29, 2014

Datum: Ground Elevation
Figure Number: A.1
Page: 1 of 1

Test Hole Log: TH14-02

File: 12376
Project: Preliminary Geotechnical Investigation Report
Client: Coastal Health
Site Location: West 57 to 59 Ave., Cambie to Heather St., Vancouv

GeoPacific Consultants Ltd.
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax 604-439-9189

INFERRED PROFILE

Depth	Symbol	SOIL DESCRIPTION	Depth/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
ft m		Ground Surface					
0 0		**Asphalt (50mm)**	0.0				
1		**Fill (Till)** Cobbly till FILL, brown.	0.2				
2		**Silt and Sand (Glacial)** Dense SILT and SAND till, trace/some of gravel, occ. cobble, brown, @1.2m very dense, some of gravel.					
3 1							
4							
5							
6 2							
7							
8		@2.7m become grey, some of moisture.					2.5m perched ground water.
9							
10 3							
11							
12							
13 4							
14		@4.5m trace/some of moisture.		7.6			
15							
16 5							
17							
18							
19				8.5			
20 6							6m assumed water table.
21							

Logged: AM
Method: Solid Stem Auger
Date: July 28-29, 2014

Datum: Ground Elevation
Figure Number: A.2
Page: 1 of 2

Test Hole Log: TH14-02

File: 12376
Project: Preliminary Geotechnical Investigation Report
Client: Coastal Health
Site Location: West 57 to 59 Ave., Cambie to Heather St., Vancouv

GeoPacific Consultants Ltd.
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel 604-439-0922 Fax 604-439-9189

Depth	Symbol	SOIL DESCRIPTION (INFERRED PROFILE)	Depth/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
22							
23 – 7							
24							
25							
26 – 8							
27							
28							
29 – 9							
30							
31							
32							
33 – 10							
34							
35							
36 – 11							
37							
38							
39 – 12							
40		End of Borehole	12.2	9.0			
41							
42							

Logged: AM
Method: Solid Stem Auger
Date: July 28-29, 2014

Datum: Ground Elevation
Figure Number: A.2
Page: 2 of 2

Test Hole Log: TH14-03

File: 12376
Project: Preliminary Geotechnical Investigation Report
Client: Coastal Health
Site Location: West 57 to 59 Ave., Cambie to Heather St , Vancouv

GeoPacific Consultants Ltd.
216 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 / 0		Ground Surface					
		Asphalt (63mm)	0.0				
1		***Fill (Till)*** Compact silt and sand till FILL, yellow brown.					
2		***Silt and Sand (Glacial)*** Very stiff SILT and SAND glacial till, some gravel, occ. cobble, some of moisture, brown. @1m become very dense, trace of moisture.		13.7			
3 / 1							
4							
5							
6 / 2		@2.2m become grey, sandier,					
7							
8							
9				7.4			
10 / 3							
11							
12							
13 / 4							
14				7.8			
15							
16 / 5		@5m some moisture,					5m assumed water table. Increased rate of penetration,
17							
18				11.2			
19							
20 / 6		End of Borehole	6.1				
21							

Logged: AM
Method: Solid Stem Auger
Date: July 28-29, 2014

Datum: Ground Elevation
Figure Number: A.1
Page: 1 of 1

Test Hole Log: TH14-04

File: 12376
Project: Preliminary Geotechnical Investigation Report
Client: Coastal Health
Site Location: West 57 to 59 Ave., Cambie to Heather St., Vancouv

GeoPacific Consultants Ltd.
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax:604-439-0189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 / 0		Ground Surface					
		Asphalt (125mm)	0.0				
1		***Fill (Sand and Gravel)*** Dense gravel and sand FILL, brown.					
2						>50	
3 / 1						>50	
		Silt and Sand (Glacial) Very stiff SILT and SAND till, some gravel, brown.	0.9			>50	
4		***Sand*** Compact to dense medium grained SAND, trace of gravel, trace of silt, some moisture, brown.	1.2				
5							
6 / 2							
7							
8		***Silt and Sand (Glacial)*** Very dense to dense SILT and SAND till, some of gravel, occ. cobble, grey.	2.4				
9							
10 / 3							
11							
12							
13 / 4							
14							
15							
16 / 5							
17							
18		End of Borehole	5.5				Auger refusal.
19							
20 / 6							
21							

Logged: AM
Method: Solid Stem Auger
Date: July 28-29, 2014

Datum: Ground Elevation
Figure Number: A.04
Page: 1 of 1

Test Hole Log: TH14-05

File: 12376
Project: Preliminary Geotechnical Investigation Report
Client: Coastal Health
Site Location: West 57 to 59 Ave., Cambie to Heather St., Vancouv

GeoPacific Consultants Ltd.
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth (ft)	Depth (m)	Symbol	SOIL DESCRIPTION	Depth/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0	0		Ground Surface					
0	0		***Asphalt (75mm)***	0.0				
1			***Fill (Sand and Gravel)*** Compact sand and gravel FILL, grey.					
3	1		***Silt*** Very stiff to stiff SILT, sandy, trace of gravel, orange brown.	0.8				
5					12.4			
6	2		***Sand*** Compact to dense SAND, some of silt, fine grained, trace of gravel, yellow brown, @2.1m moist.	1.5				2m assumed perched water.
9			***Silt and Sand (Glacial)*** Dense to very dense SILT and SAND till, some/trace of gravel, occ. coble, brown, moist.	2.6	13.7			
13	4		@4m become grey, trace of moisture.					
16					8.6			
18	5							
19					9.7			
20	6		@6m some of moisture					
21								

Logged: AM
Method: Solid Stem Auger
Date: July 28-29, 2014

Datum: Ground Elevation
Figure Number: A.5
Page: 1 of 2

Test Hole Log: TH14-05

File: 12376
Project: Preliminary Geotechnical Investigation Report
Client: Coastal Health
Site Location: West 57 to 59 Ave., Cambie to Heather St., Vancouv

GeoPacific Consultants Ltd.
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax604-439-0189

Depth	Symbol	SOIL DESCRIPTION	Depth/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
22							
23 7							
24							
25							7.6m estimated water table.
26 8							
27							
28							
29				9.9			
30 9							
31							
32							
33 10							
34							
35							
36 11							
37							
38		End of Borehole	11.6				Auger refusal.
39 12							
40							
41							
42							

Logged: AM
Method: Solid Stem Auger
Date: July 28-29, 2014

Datum: Ground Elevation
Figure Number: A.5
Page: 2 of 2

Test Hole Log: TH14-06

File: 12376
Project: Preliminary Geotechnical Investigation Report
Client: Coastal Health
Site Location: West 57 to 59 Ave., Cambie to Heather St., Vancouv

GeoPacific Consultants Ltd.
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax604-439-9189

INFERRED PROFILE

Depth (ft / in)	Symbol	SOIL DESCRIPTION	Depth/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 / 0		Ground Surface					
		Asphalt (125mm)	0.0		21		
1		***Fill (Sand)*** Very dense gravelly sand FILL, brown.					
2					>50		
3 / 1		***Silt (Glacial)*** Very stiff SILT, low plastic, some of sand, trace of gravel, occ. cobble, brown.	0.8		>50		
4					31		
5				19.2	39		
6 / 2					41 >50		
7		***Sand and Silt (Glacial)*** Very dense SAND and SILT till, trace of gravel, occ. cobble, brown.	2.0				
8							
9				11.0			
10 / 3							
11							
12		End of Borehole	3.7				Auger refusal.
13 / 4							
14							
15							
16 / 5							
17							
18							
19							
20 / 6							
21							

Logged: AM
Method: Solid Stem Auger
Date: July 28-29, 2014

Datum: Ground Elevation
Figure Number: A 06
Page: 1 of 1

Test Hole Log: TH14-07

File: 12376
Project: Preliminary Geotechnical Investigation Report
Client: Coastal Health
Site Location: West 57 to 59 Ave., Cambie to Heather St., Vancouv

GeoPacific Consultants Ltd.
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax:604-439-0189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 / 0		Ground Surface					
		Asphalt (75mm)	0.0				
1		***Fill (Sand)*** Compact sand FILL, silty, some gravel, black.	0.3				
2		***Silt*** Very stiff SILT, some/trace of sand, trace of gravel, brown. @1.1m some of clay, light brown, stiff to very stiff.					
3 / 1				22.7			
5		***Silt (Glacial)*** Very stiff SILT dominant till, sandy, trace/some of gravel, oco, cobble, brown, trace/some moisture.	1.5				
6							
7 / 2							
8							
9				10.8			
10 / 3		@3m some of moisture.					
11							
12							
13 / 4							
14				11.3			
15		***Sand (Glacial)*** Dense to compact fine to medium grained SAND, trace/some gavel, silty, grey, wet,	4.8			▼	4.5m assumed water table. Increased rate of penetration.
16 / 5							
17							
18							
19				14.4			
20 / 6		End of Borehole	6.1				
21							

Logged: AM
Method: Solid Stem Auger
Date: July 28-29, 2014

Datum: Ground Elevation
Figure Number: A.7
Page: 1 of 1

Test Hole Log: TH14-08

File: 12376
Project: Preliminary Geotechnical Investigation Report
Client: Coastal Health
Site Location: West 57 to 59 Ave., Cambie to Heather St., Vancouver

GeoPacific Consultants Ltd.
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-9189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 / 0		Ground Surface					
		Asphalt (150mm)	0.0				
		Fill (Sand and Gravel) Dense silt and sand and gravel, cobbly, damp.					
3 / 1		***Silt and Sand (Glacial)*** Very stiff SILT till, sandy, trace of gravel, moist, light brown.		14.2			
6 / 2		@1.5m become very dense SILT and SAND, brown, trace of moisture.		9.6			
13 / 4		@4m become grey.					
15 / 5		***Sand (Glacial)*** Dense SAND, some of silt to silty, some of gravel, grey.	4.6	10.9		▽	4.5m assumed water table.
20 / 6		End of Borehole	6.1	9.7			

Logged: AM
Method: Solid Stem Auger
Date: July 28-29, 2014

Datum: Ground Elevation
Figure Number: A.8
Page: 1 of 1

Test Hole Log: TH14-09

File: 12376
Project: Preliminary Geotechnical Investigation Report
Client: Coastal Health
Site Location: West 57 to 59 Ave., Cambie to Heather St., Vancouv

GeoPacific Consultants Ltd.
215 – 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax604-439-9189

INFERRED PROFILE

Depth	Symbol	SOIL DESCRIPTION	Depth/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
ft / m		Ground Surface					
0 / 0		***Asphalt (100mm)***	0.0				
1		***Fill (Sand)*** Compact sand FILL, some gravel, grey.	0.3				
2		***Fill (Till)*** Stiff silt till FILL, sandy, some gravel, dark grey.					
3 / 1		***Organic Horizon***	0.9				
4		***Silt*** Stiff SILT, trace of sand and gravel, light yellow brown.	1.4				
5		***Sand*** Compact SAND, medium grained, trace of moisture, light grey.	1.7				
6 / 2		***Silt and Sand (Glacial)*** Very stiff SILT dominant till, and SAND to sandy, trace of gravel, trace/some moisture, brown.					
7					9		
8					13		
9				11.9	12		
10 / 3		@3.3m very dense.			9		
11					19		
12					31		
13 / 4					30		
14				11.5	39		
15		@4.5m some of moisture, become silty SAND glacial till, dense to very dense.			43		4.5m assumed water table.
16 / 5					41		
17					38		
18							
19				10.4			
20 / 6							
21							

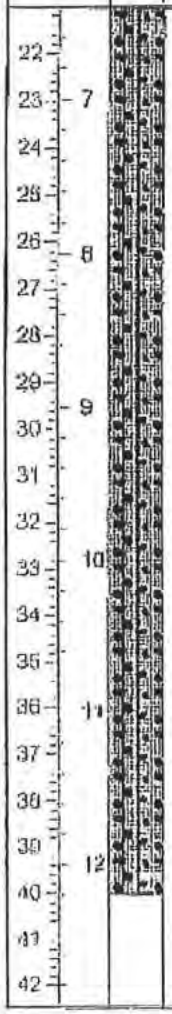
Logged: AM
Method: Solid Stem Auger
Date: July 28-29, 2014

Datum: Ground Elevation
Figure Number: A.9
Page: 1 of 2

Test Hole Log: TH14-09

File: 12376
Project: Preliminary Geotechnical Investigation Report
Client: Coastal Health
Site Location: West 57 to 59 Ave., Cambie to Heather St., Vancouv

GeoPacific Consultants Ltd.
216 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax604-439-9189



Logged: AM
Method: Solid Stem Auger
Date: July 28-29, 2014

Datum: Ground Elevation
Figure Number: A.9
Page: 2 of 2

Test Hole Log: TH14-10

File: 12376
Project: Preliminary Geotechnical Investigation Report
Client: Coastal Health
Site Location: West 57 to 59 Ave., Cambie to Heather St., Vancouv

GeoPacific Consultants Ltd.
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax: 604-439-0189

Depth (ft / m)	Symbol	SOIL DESCRIPTION (INFERRED PROFILE)	Depth/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 / 0		Ground Surface					
		Asphalt (150mm)	0.0				
1		***Fill (Sand and Gravel)*** Very dense sand and gravel FILL, brown.	0.5				
2		***Silt and Sand (Glacial)*** Compact SILT and SAND till, trace of gravel, orange brown, @1m become dense to very dense, brown.					
1							
3							
4							
5							
6 / 2							
7							
8		@2.7m become grey, some/trace of moisutre.					
9							
10 / 3							
11							
12							
13 / 4		@4.2m some of gravel.					
14							
15		End of Borehole	4.6				4.6m auger refusal.
16 / 5							
17							
18							
19							
20 / 6							
21							

Logged: AM
Method: Solid Stem Auger
Date: July 28-29, 2014

Datum: Ground Elevation
Figure Number: A.10
Page: 1 of 1

Test Hole Log: TH14-11

File: 12376
Project: Preliminary Geotechnical Investigation Report
Client: Coastal Health
Site Location: West 57 to 59 Ave., Cambie to Heather St., Vancouv

GeoPacific Consultants Ltd.
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax 604-439-9189

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 / 0		Ground Surface					
		Asphalt (75mm)	0.0		20		
1		***Fill (Sand)*** Very dense gravelly sand FILL, brown.					
2						>50	
3 / 1		***Organic Sand*** Compact black organic SAND.	0.8				
4		***Sand*** Compact SAND, brown, trace/some of gravel.	1.3				
5							
6 / 2							
7		***Silt*** Very stiff SILT, some of clay, trace of gravel, low plastic, brown.	2.1				
8				22.7			
9							
10 / 3		***Silt and Sand (Glacial)*** Very dense SILT and SAND till, some of gravel, occ. cobble, trace of moisture, brown.	3.0				
12							
13 / 4		@4m, trace of moisture.					
14				12.6			
15		@4.5m some moisture.				▼	4.5m estimated water table.
16							
17 / 5							
18							
19				8.6			
20 / 6		End of Borehole	6.1				
21							

Logged: AM
Method: Solid Stem Auger
Date: July 28-29, 2014

Datum: Ground Elevation
Figure Number: A.11
Page: 1 of 1

Test Hole Log: TH14-12

File: 12376
Project: Preliminary Geotechnical Investigation Report
Client: Coastal Health
Site Location: West 57 to 59 Ave., Cambie to Heather St., Vancouv

GeoPacific Consultants Ltd.
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax 604-439-9189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 / 0		Ground Surface					
		Asphalt (75mm)	0.0				
1		***Fill (Sand and Gravel)*** Dense gravel and sand FILL, brown.	0.2				
2		***Silt*** Very stiff SILT, some clay, trace of gravel, brown.	0.6				
3 / 1		***Silt and Sand (Glacial)*** Dense to compact SILT and SAND till, some of gravel, occ. cobble, grey, some of moisture.					
4		@1.2m dense, some/trace of gravel.					
5							
6 / 2							
7							
8		@2.7m some moisture, grey.					
9			2.7				
10 / 3		***Sand (Glacial)*** Dense SAND till, silty, some/trace of gravel, grey.					
11							
12							
13 / 4							
14							
15							
16 / 5							
17							
18		@5.5m SAND and SILT to silty.					
19							
20 / 6							
		End of Borehole	6.1				
21							

Logged: AM
Method: Solid Stem Auger
Date: July 28-29, 2014

Datum: Ground Elevation
Figure Number: A.12
Page: 1 of 1

Test Hole Log: TH14-13

File: 12376
Project: Preliminary Geotechnical Investigation Report
Client: Coastal Health
Site Location: West 57 to 59 Ave., Cambie to Heather St., Vancouv

GeoPacific Consultants Ltd.
216 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax 604-439-9189

INFERRED PROFILE

Depth (ft)	Depth (m)	Symbol	SOIL DESCRIPTION	Depth/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0	0		Ground Surface					
			Asphalt (60mm)	0.0				
1			**Fill (Sand)** Compact gravelly sand FILL, grey.	0.2		33		
2			**Organic Horizon**			14		
3	1		**Sand** Compact SAND, brown, wet,	0.8		22		
4			**Silt** Very stiff SILT, some of clay, trace of gravel, brown.	1.2		17		
5					23.6	20		
6			**Silt and Sand (Glacial)** Dense SILT and SAND till, some of gravel, occ. cobble, trace of moisture, brown. @2.1m very dense to dense.			38		
7	2							
8								
9						40		
10	3		@3.1m become sandier, grey, compact to dense,		16.9			
11						20		
12								
13	4					34		4m estimated water table, free water in test hole.
14					9.2			
15			**Sand (Glacial)** Very dense SAND, some of silt, moist, some gravel, grey.	7.6				
16	5							
17								
18								
19					10.9			
20	6							
21								

Logged: AM
Method: Solid Stem Auger
Date: July 28-29, 2014

Datum: Ground Elevation
Figure Number: A 13
Page: 1 of 2

Test Hole Log: TH14-13

File: 12376
Project: Preliminary Geotechnical Investigation Report
Client: Coastal Health
Site Location: West 57 to 59 Ave., Cambie to Heather St., Vancouv

GeoPacific Consultants Ltd.
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth	Symbol	SOIL DESCRIPTION	Depth/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
22							
23 – 7		***Silt and Sand (Glacial)*** Very dense SILT and SAND till, some of gravel, occ. cobble, grey.	7.0				
24							
25							
26 – 8							
27							
28							
29				9.4			
30 – 9							
31							
32							
33 – 10							Poor recovery below 10m.
34							
35							
36 – 11							
37							
38							
39 – 12							
40		End of Borehole	12.2				
41							
42							

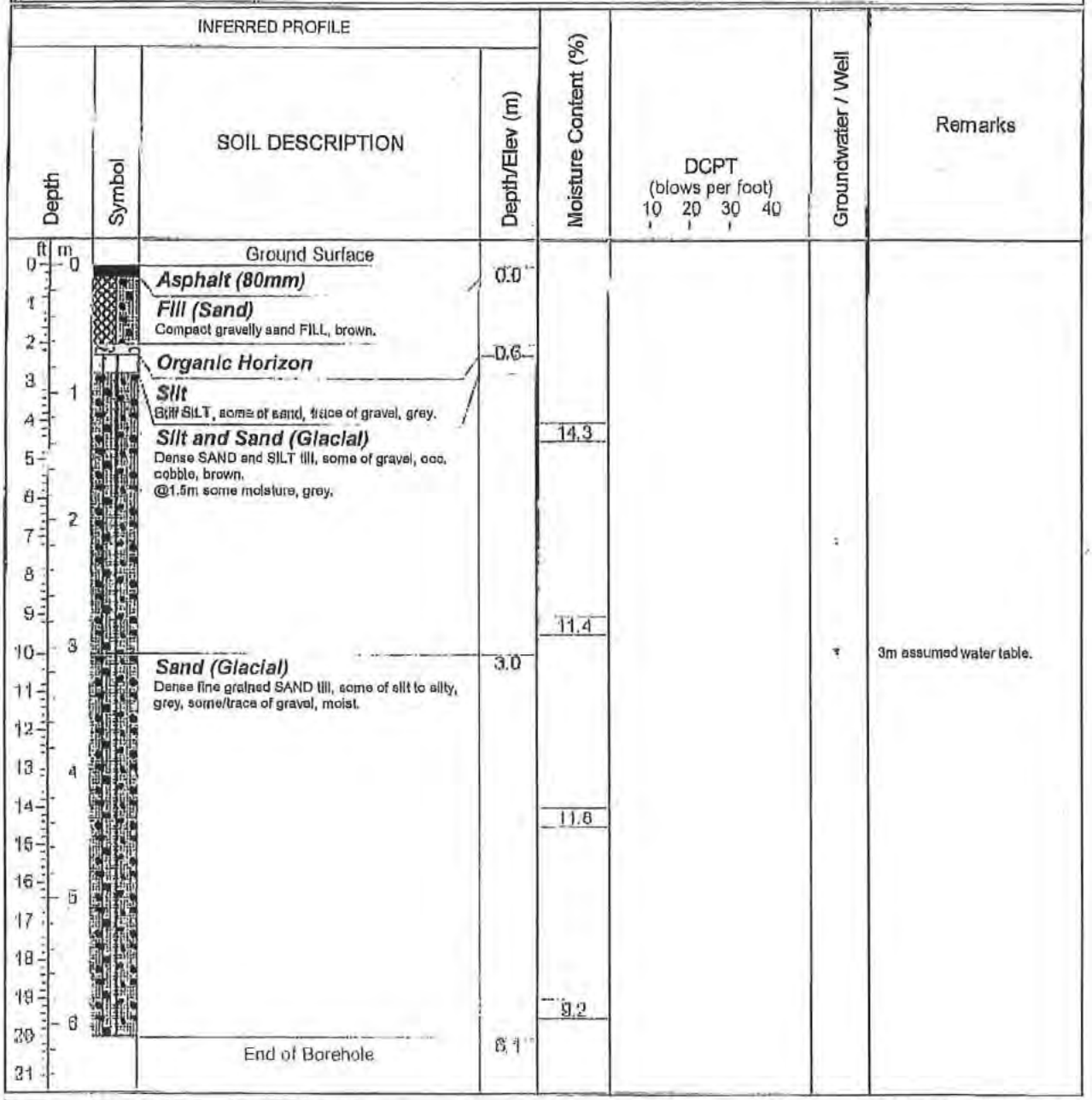
Logged: AM
Method: Solid Stem Auger
Date: July 28-29, 2014

Datum: Ground Elevation
Figure Number: A.13
Page: 2 of 2

Test Hole Log: TH14-14

File: 12376
Project: Preliminary Geotechnical Investigation Report
Client: Coastal Health
Site Location: West 57 to 59 Ave., Cambie to Heather St., Vancouv

GeoPacific Consultants Ltd.
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax:604-439-9189



Logged: AM
Method: Solid Stem Auger
Date: July 28-29, 2014

Datum: Ground Elevation
Figure Number: A.14
Page: 1 of 1

Test Hole Log: TH14-15

File: 12376
Project: Preliminary Geotechnical Investigation Report
Client: Coastal Health
Site Location: West 57 to 59 Ave., Cambie to Heather St., Vancouv

GeoPacific Consultants Ltd.
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax 604-439-0189

Depth (ft / m)	Symbol	SOIL DESCRIPTION (INFERRED PROFILE)	Depth/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 / 0		Ground Surface					
		Asphalt (75mm)	0.0				
		Fill (Sand and Gravel) Dense gravel and sand FILL, brown.	0.5				
		Sand Compact SAND, some silt, some organics, black.	0.9				
1		***Sand*** Compact SAND, some of gravel, brown, moist.	1.2				
		Silt Stiff to very stiff SILT, sandy, trace of gravel, brown.	1.5				
2		***Silt and Sand (Glacial)*** Very dense to dense SILT and SAND till, some of gravel, occ. cobble, grey, some of moisture.					
3							
4		@4.5-6m trace of moisture.					
5							
6		End of Borehole	6.1				

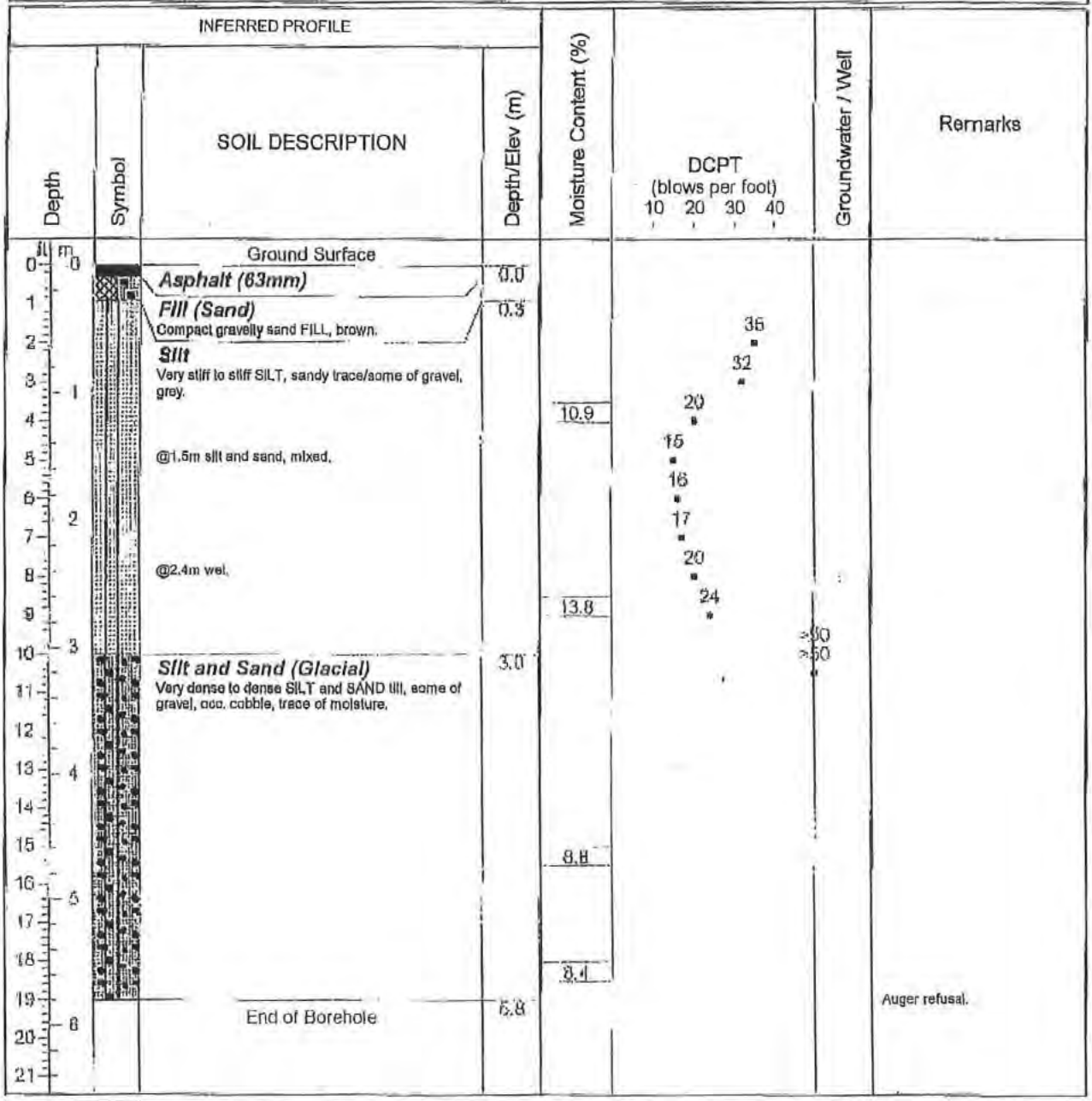
Logged: AM
Method: Solid Stem Auger
Date: July 28-29, 2014

Datum: Ground Elevation
Figure Number: A.15
Page: 1 of 1

Test Hole Log: TH14-16

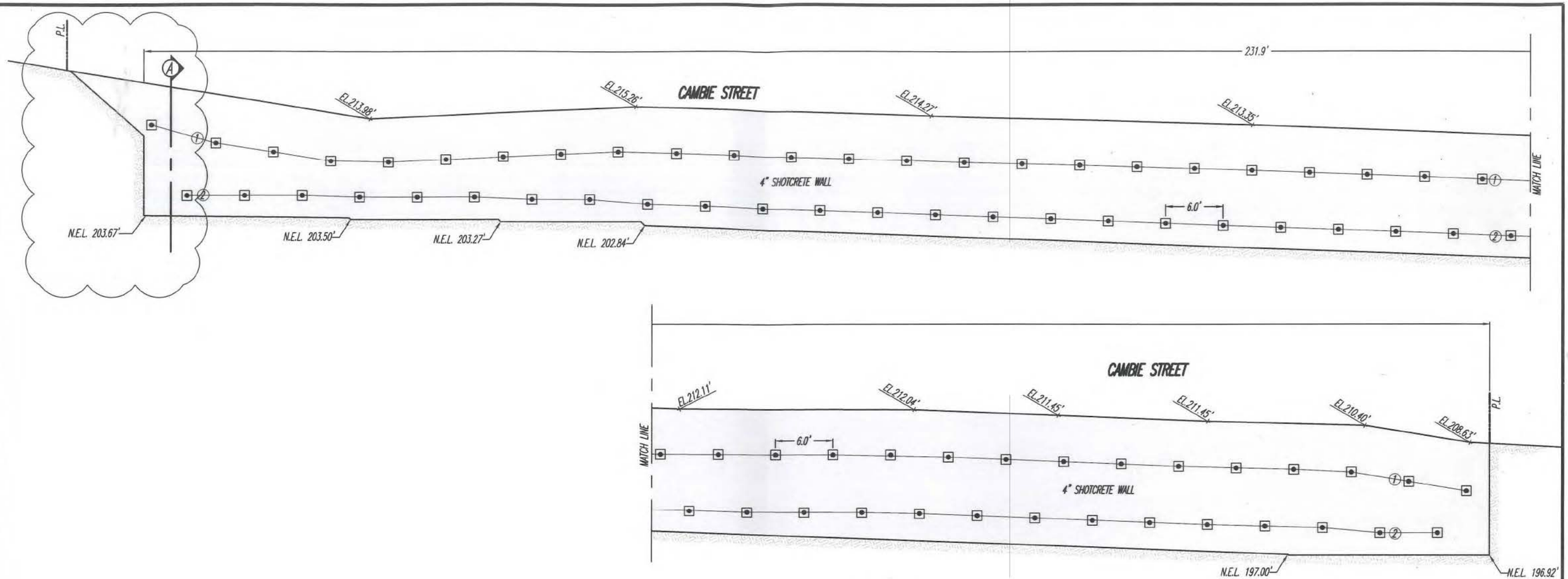
File: 12376
Project: Preliminary Geotechnical Investigation Report
Client: Coastal Health
Site Location: West 57 to 59 Ave., Cambie to Heather St., Vancouv

GeoPacific Consultants Ltd.
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax:604-439-9189



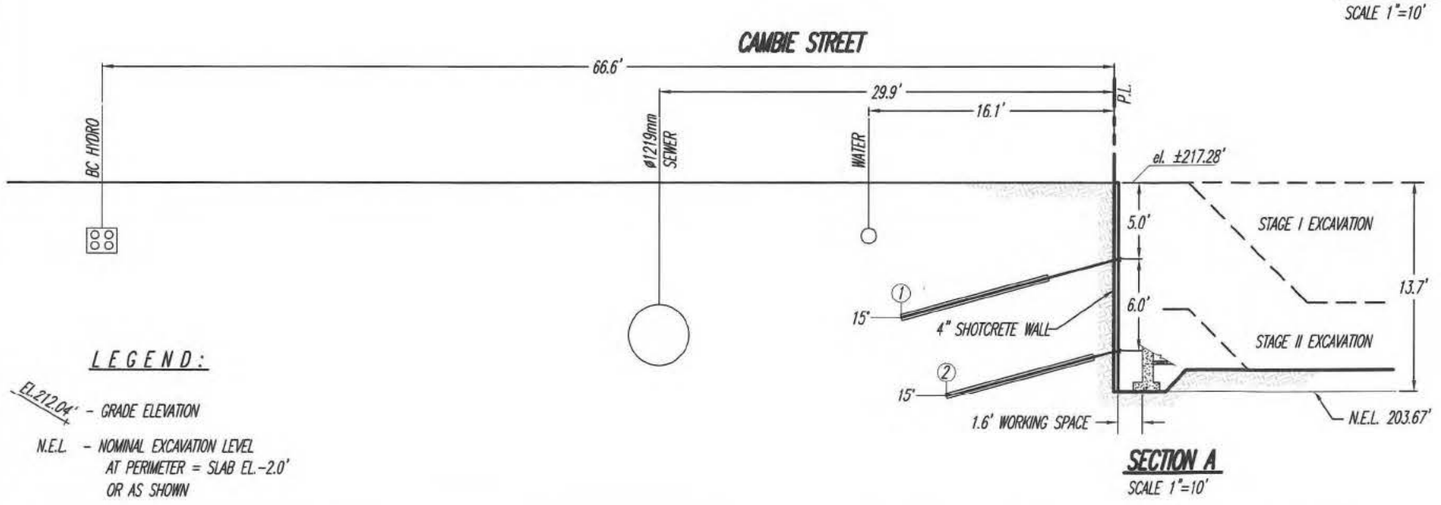
Logged: AM
Method: Solid Stem Auger
Date: July 28-29, 2014

Datum: Ground Elevation
Figure Number: A 16
Page: 1 of 1



EAST ELEVATION

SCALE 1"=10'



SECTION A

SCALE 1"=10'

LEGEND:

EL.212.04' - GRADE ELEVATION

N.E.L. - NOMINAL EXCAVATION LEVEL AT PERIMETER = SLAB EL.-2.0' OR AS SHOWN

SECTION A
DYWIDAG ∅6 Gr 75/100 OR APPROVED ALTERNATE

ROW	LENGTH (ft)	GROUTED (ft)	LOCKOFF (kips)	SPACING (ft)
1	15	10	16	6
2	12	10	16	6

CONTRACTOR TO CONFIRM LOCATION OF ALL U/G UTILITIES AND STRUCTURES

RE-ISSUED FOR BP SUBMISSION

Certified Professional Program
NOV 28 2016
This stamp shall only operate to signify that these documents form part of the CP Project and shall not constitute an approval of design services rendered by others.
CARLITO CABAHUG

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
M. J. KOKAN
21364

NOV 24 2016

REFERENCE:

GEOPACIFIC VANCOUVER KAMLOOPS CALGARY
1779 W. 75th Avenue
Vancouver, B.C. V6P 6P2
P 604.439.0922
F 604.439.9189

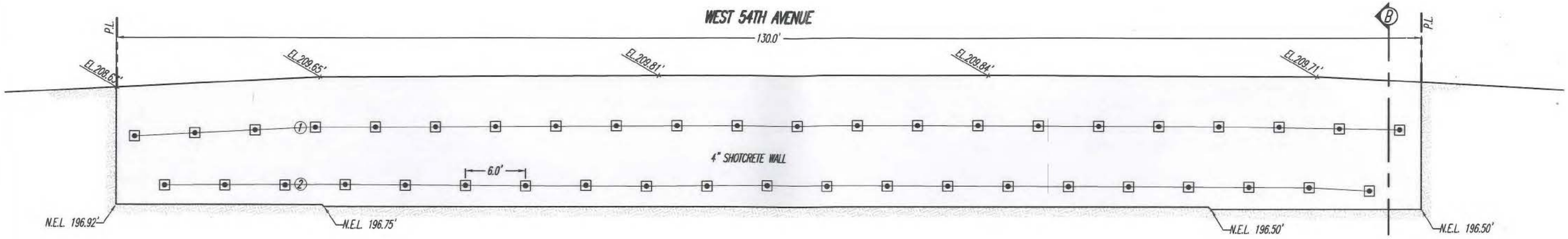
DATE:	JANUARY 13, 2016	
DRAWN BY: C.T.	APPROVED BY: M.J.K.	REVIEWED BY: M.J.K.
SCALE:	AS SHOWN	

CAMBRIA PARK
54TH & CAMBIE STREET, VANCOUVER, B.C.
SHORING - EAST ELEVATION & SECTION A

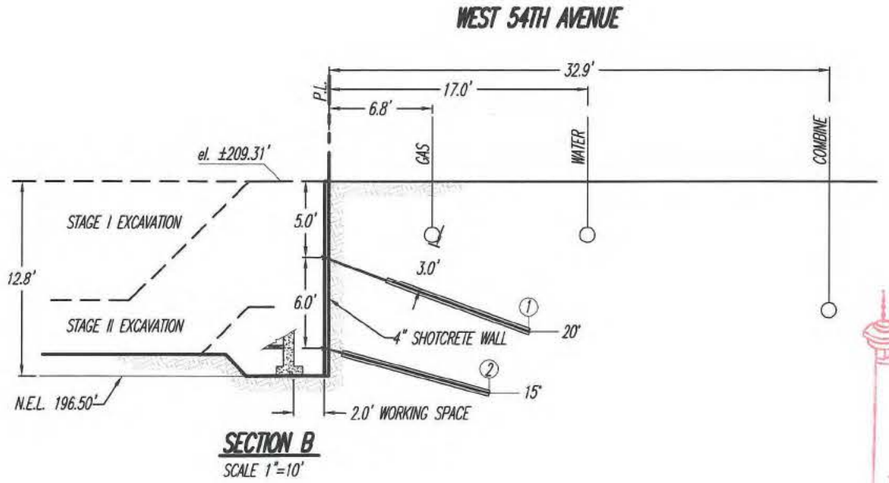
FILE NO.: 12339
DWG. NO.: G-S2

REVISIONS:
A. FEBRUARY 1 , 2016
B. MARCH 7, 2016 - ISSUED FOR BP STAGE 1
C. APRIL 27, 2016 - ADDED RAKER DESIGN
D. MAY 25, 2016 - BC HYDRO
E. JUNE 14, 2016 - ARCH. UPDATE
F. JUNE 29, 2016

ORIGINAL PAPER SIZE: 11"x17"



SOUTH ELEVATION
SCALE 1"=10'



SECTION B
SCALE 1"=10'

SECTION B
DYWIDAG #6 Gr 75/100 OR APPROVED ALTERNATE

ROW	LENGTH (ft)	GROUTED (ft)	LOCKOFF (kips)	SPACING (ft)
1	15	10	16	6
2	12	10	16	6

CONTRACTOR TO CONFIRM LOCATION OF ALL U/G UTILITIES AND STRUCTURES

LEGEND:

EL.212.04' - GRADE ELEVATION

N.E.L. - NOMINAL EXCAVATION LEVEL AT PERIMETER = SLAB EL.-2.0' OR AS SHOWN

RE-ISSUED FOR BP SUBMISSION

NOV 24 2016

ORIGINAL PAPER SIZE 11"x17"

REFERENCE:

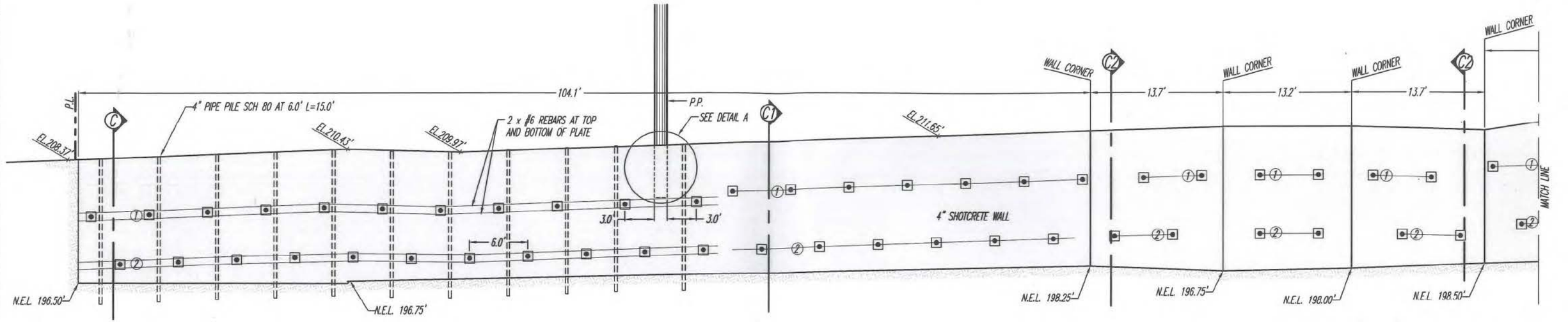
GEOPACIFIC
VANCOUVER KAMLOOPS CALGARY
1779 W. 75th Avenue
Vancouver, B.C. V6P 6P2
P 604.439.0922
F 604.439.9189

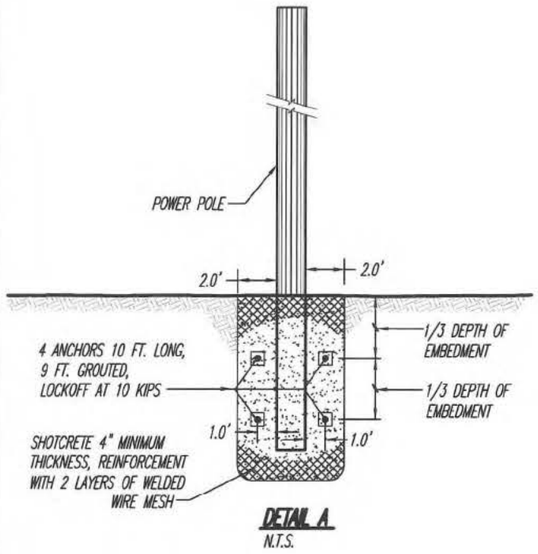
DATE:	JANUARY 13, 2016	
DRAWN BY: C.T.	APPROVED BY: M.J.K.	REVIEWED BY: M.J.K.
SCALE:	AS SHOWN	

CAMBRIA PARK
54TH & CAMBIE STREET, VANCOUVER, B.C.
SHORING - SOUTH ELEVATION & SECTION B

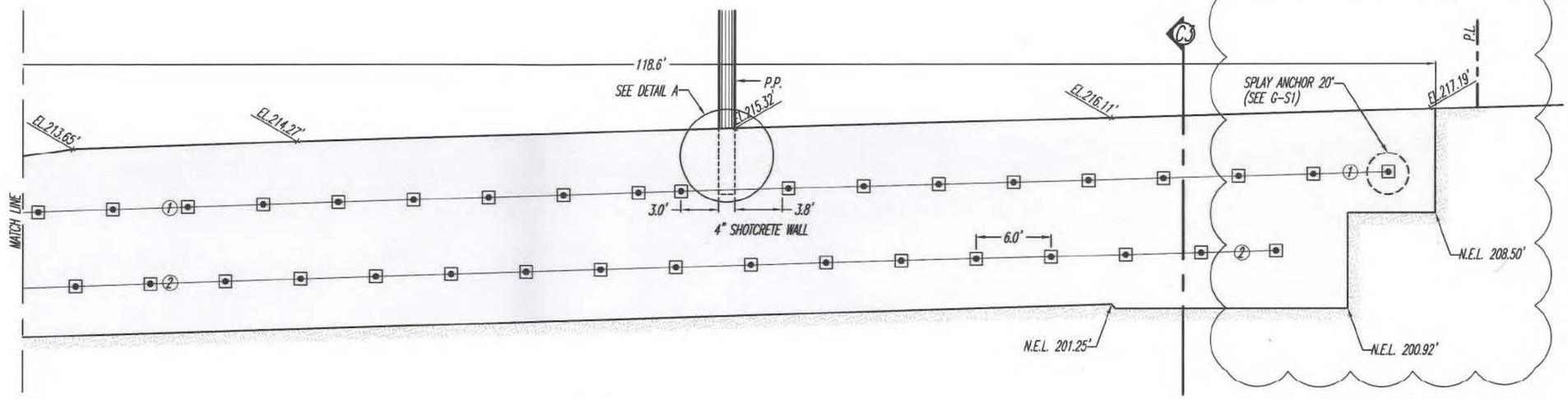
FILE NO.: 12339
DWG. NO.: G-S3

REVISIONS:
A. FEBRUARY 1 , 2016
B. MARCH 7, 2016 - ISSUED FOR BP STAGE 1
C. APRIL 27, 2016 - ADDED RAKER DESIGN
D. JUNE 14, 2016 - ARCH. UPDATE
E.
F.

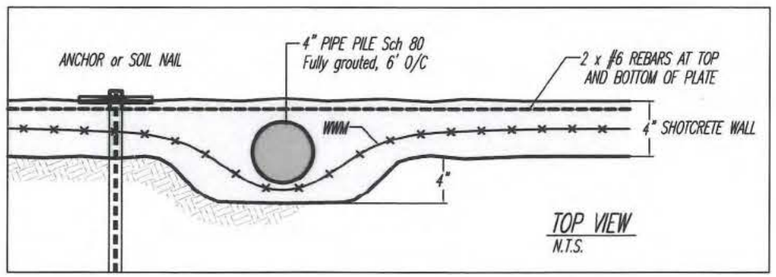




DETAIL A
N.T.S.



WEST ELEVATION
SCALE 1"=10'



TOP VIEW
N.T.S.

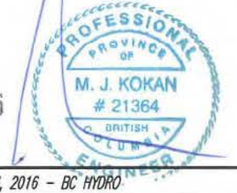
RE-ISSUED FOR BP SUBMISSION

NOV 24 2016

LEGEND:

EL.212.04' – GRADE ELEVATION

N.E.L. – NOMINAL EXCAVATION LEVEL AT PERIMETER = SLAB EL.–2.0' OR AS SHOWN



REFERENCE:

GEOPACIFIC
VANCOUVER KAMLOOPS CALGARY
1779 W. 75th Avenue
Vancouver, B.C. V6P 6P2
P 604.439.0922
F 604.439.9189

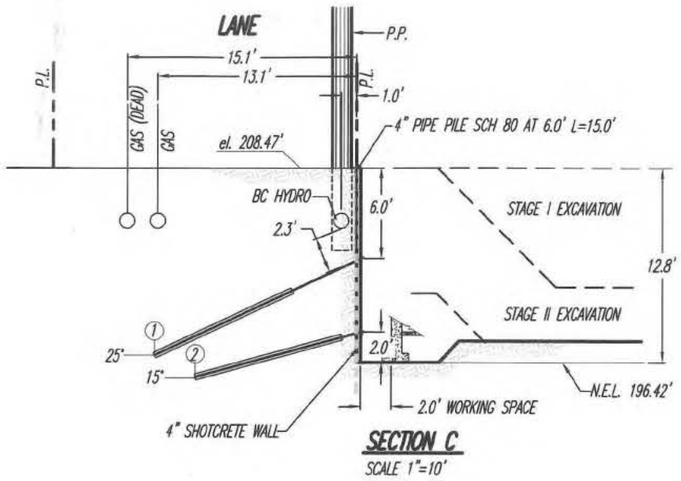
DATE:	JANUARY 13, 2016	
DRAWN BY: C.T.	APPROVED BY: M.J.K.	REVIEWED BY: M.J.K.
SCALE:	AS SHOWN	

CAMBRIA PARK
54TH & CAMBIE STREET, VANCOUVER, B.C.
SHORING – WEST ELEVATION

FILE NO.: 12339
DWG NO.: G-S4A

REVISIONS:
A. FEBRUARY 1, 2016
B. MARCH 7, 2016 – ISSUED FOR BP STAGE 1
C. APRIL 27, 2016 – ADDED RAKER DESIGN
D. JUNE 6, 2016 – BC HYDRO
E. JUNE 14, 2016 – ARCH. UPDATE
F. JUNE 29, 2016

ORIGINAL PAPER SIZE 11"x17"

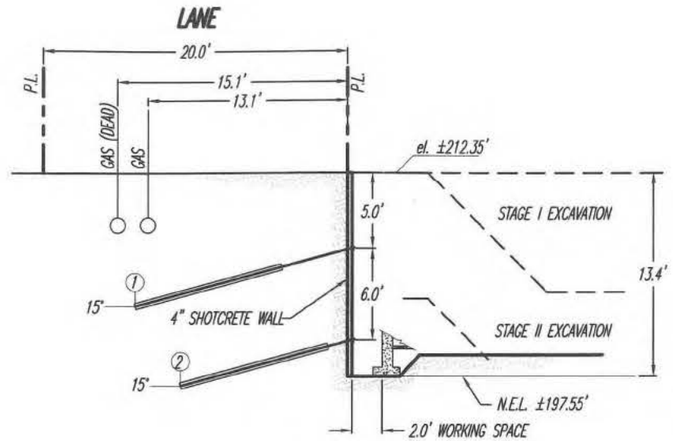


SECTION C
SCALE 1"=10'

SECTION C
DYWIDAG #6 Gr 75/100 OR APPROVED ALTERNATE

ROW	LENGTH (ft)	GROUTED (ft)	LOCKOFF (kips)	SPACING (ft)
1	15	10	16	6
2	12	10	16	6

CONTRACTOR TO CONFIRM LOCATION
OF ALL U/G UTILITIES AND STRUCTURES

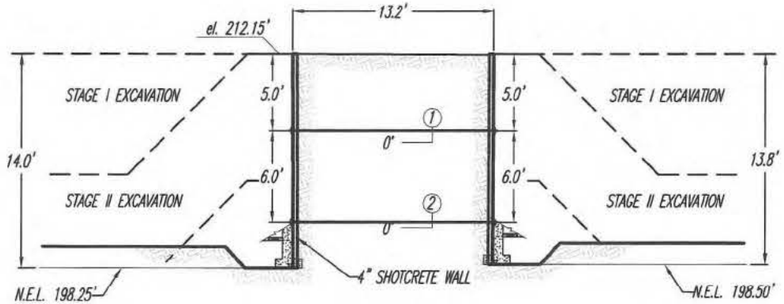


SECTION C1
SCALE 1"=10'

SECTION C1
DYWIDAG #6 Gr 75/100 OR APPROVED ALTERNATE

ROW	LENGTH (ft)	GROUTED (ft)	LOCKOFF (kips)	SPACING (ft)
1	15	10	16	6
2	12	10	16	6

CONTRACTOR TO CONFIRM LOCATION
OF ALL U/G UTILITIES AND STRUCTURES

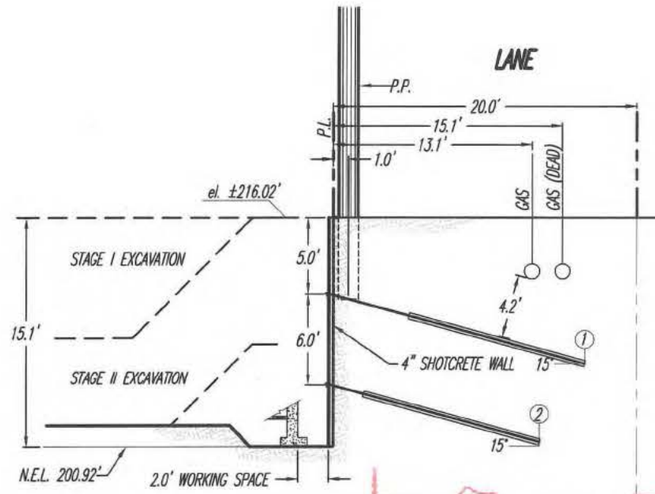


SECTION C2
SCALE 1"=10'

SECTION C2
DYWIDAG #6 Gr 75/100 OR APPROVED ALTERNATE

ROW	LENGTH (ft)	GROUTED (ft)	LOCKOFF (kips)	SPACING (ft)
1	15	-	16	6
2	15	-	16	6

CONTRACTOR TO CONFIRM LOCATION
OF ALL U/G UTILITIES AND STRUCTURES



SECTION C3
SCALE 1"=10'

SECTION C3
DYWIDAG #6 Gr 75/100 OR APPROVED ALTERNATE

ROW	LENGTH (ft)	GROUTED (ft)	LOCKOFF (kips)	SPACING (ft)
1	18	12	21	6
2	15	12	21	6

CONTRACTOR TO CONFIRM LOCATION
OF ALL U/G UTILITIES AND STRUCTURES

LEGEND:

EL.212.04' - GRADE ELEVATION

N.E.L. - NOMINAL EXCAVATION LEVEL AT PERIMETER = SLAB EL.-2.0' OR AS SHOWN

RE-ISSUED FOR BP SUBMISSION

NOV 24 2016

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
M. J. KOKAN
21364

REFERENCE:

GEOPACIFIC
VANCOUVER KAMLOOPS CALGARY
1779 W. 75th Avenue
Vancouver, B.C. V6P 6P2
P 604.439.0922
F 604.439.9189

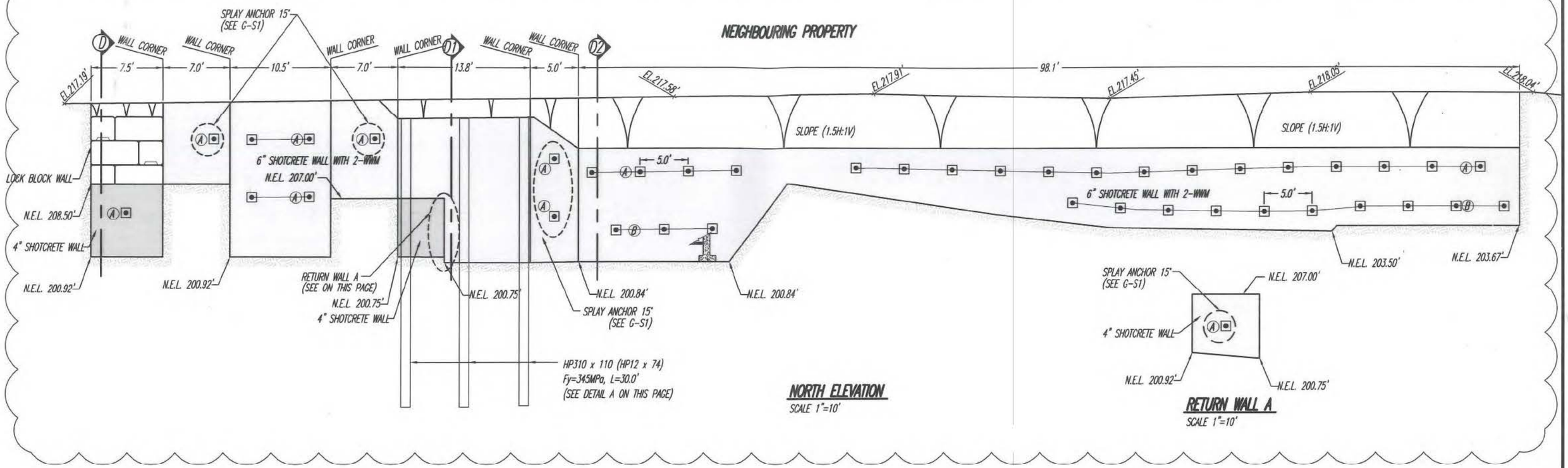
DATE:	JANUARY 13, 2016	
DRAWN BY: C.T.	APPROVED BY: M.J.K.	REVIEWED BY: M.J.K.
SCALE:	AS SHOWN	

CAMBRIA PARK
54TH & CAMBIE STREET, VANCOUVER, B.C.
SHORING - SECTION C, C1, C2 & C3

FILE NO.: 12339
DWG. NO.: G-S4B

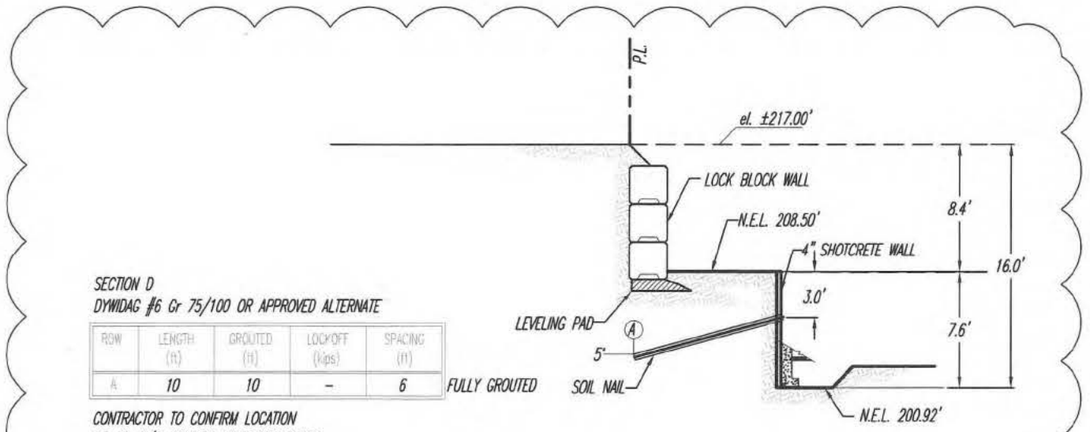
REVISIONS:
A. FEBRUARY 1 , 2016
B. MARCH 7, 2016 - ISSUED FOR BP STAGE 1
C. APRIL 27, 2016 - ADDED RAKER DESIGN
D. JUNE 6, 2016 - BC HYDRO
E. JUNE 14, 2016 - ARCH. UPDATE
F. JUNE 29, 2016

ORIGINAL PAPER SIZE: 11"x17"



NORTH ELEVATION
SCALE 1"=10'

RETURN WALL A
SCALE 1"=10'

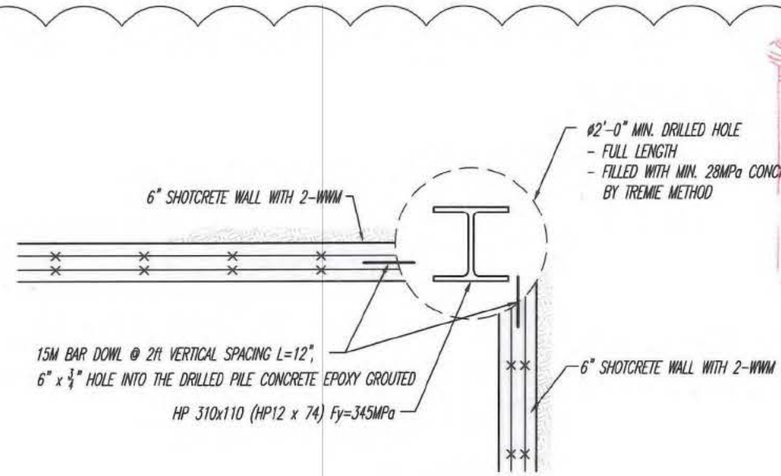


SECTION D
DYWIDAG #6 Gr 75/100 OR APPROVED ALTERNATE

ROW	LENGTH (ft)	GROUTED (ft)	LOCKOFF (kips)	SPACING (ft)	
A	10	10	–	6	FULLY GROUTED

CONTRACTOR TO CONFIRM LOCATION OF ALL U/G UTILITIES AND STRUCTURES

SECTION D
SCALE 1"=10'



DETAIL A
N.T.S.

Certified Professional Program
NOV 28 2016
This stamp shall only operate to signify that these documents form part of the CP Project and shall not constitute an approval of design services rendered by others.
CARLITO CABAHUG

LEGEND:

EL.212.04' – GRADE ELEVATION
N.E.L. – NOMINAL EXCAVATION LEVEL AT PERIMETER = SLAB EL.-2.0' OR AS SHOWN

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
M. J. KOKAN
21364
NOV 24 2016

RE-ISSUED FOR BP SUBMISSION

REFERENCE:

GEOPACIFIC VANCOUVER KAMLOOPS CALGARY
1779 W. 75th Avenue, Vancouver, B.C. V6P 6P2
P 604.439.0922 F 604.439.9189

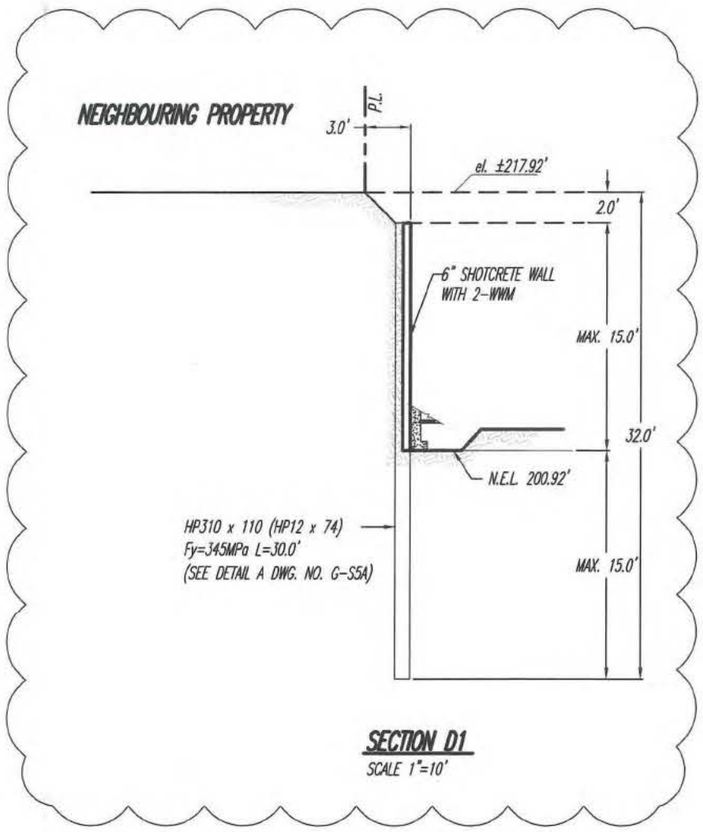
DATE: JANUARY 13, 2016
DRAWN BY: C.T. | APPROVED BY: M.J.K. | REVIEWED BY: M.J.K.
SCALE: AS SHOWN

CAMBRIA PARK
54TH & CAMBIE STREET, VANCOUVER, B.C.
SHORING – NORTH ELEVATION & SECTION D

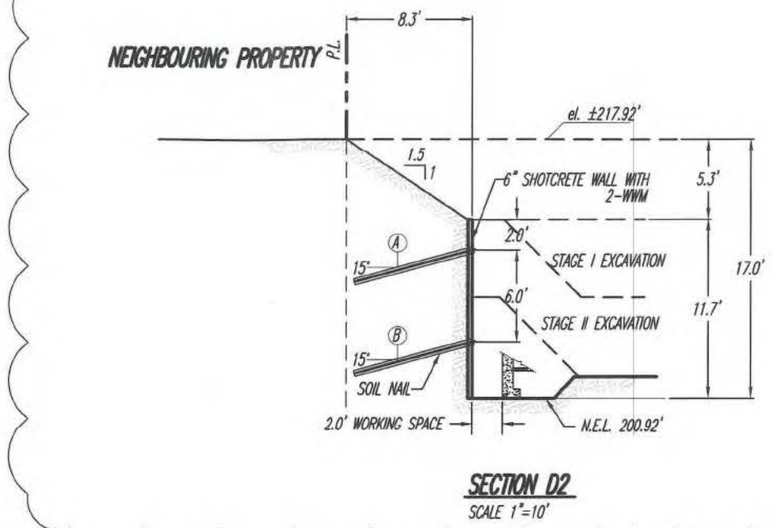
FILE NO.: 12339
DWG. NO.: G-S5A

REVISIONS:
A. FEBRUARY 1 , 2016
B. MARCH 7, 2016 – ISSUED FOR BP STAGE 1
C. APRIL 27, 2016 – ADDED RAKER DESIGN
D. JUNE 14, 2016 – ARCH. UPDATE
E. JUNE 29, 2016
F. NOVEMBER 7, 2016

ORIGINAL PAPER SIZE 11"x17"



SECTION D1
SCALE 1"=10'



SECTION D2
SCALE 1"=10'

SECTION D2
DYWIDAG #6 Gr 75/100 OR APPROVED ALTERNATE

ROW	LENGTH (ft)	GROUTED (ft)	LOCKOFF (kips)	SPACING (ft)	
A	8	8	-	5	FULLY GROUTED
B	8	8	-	5	FULLY GROUTED

CONTRACTOR TO CONFIRM LOCATION
OF ALL U/G UTILITIES AND STRUCTURES

Certified Professional Program
NOV 28 2016
This stamp shall only operate to signify that these documents form part of the CP Project and shall not constitute an approval of design services rendered by others.
CARLITO CABANLIG

LEGEND:

EL.212.04' - GRADE ELEVATION

N.E.L. - NOMINAL EXCAVATION LEVEL
AT PERIMETER = SLAB EL.-2.0'
OR AS SHOWN

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
M. J. KOKAN
21364

NOV 24 2016

RE-ISSUED FOR BP SUBMISSION

ORIGINAL PAPER SIZE 11"x17"

REFERENCE:

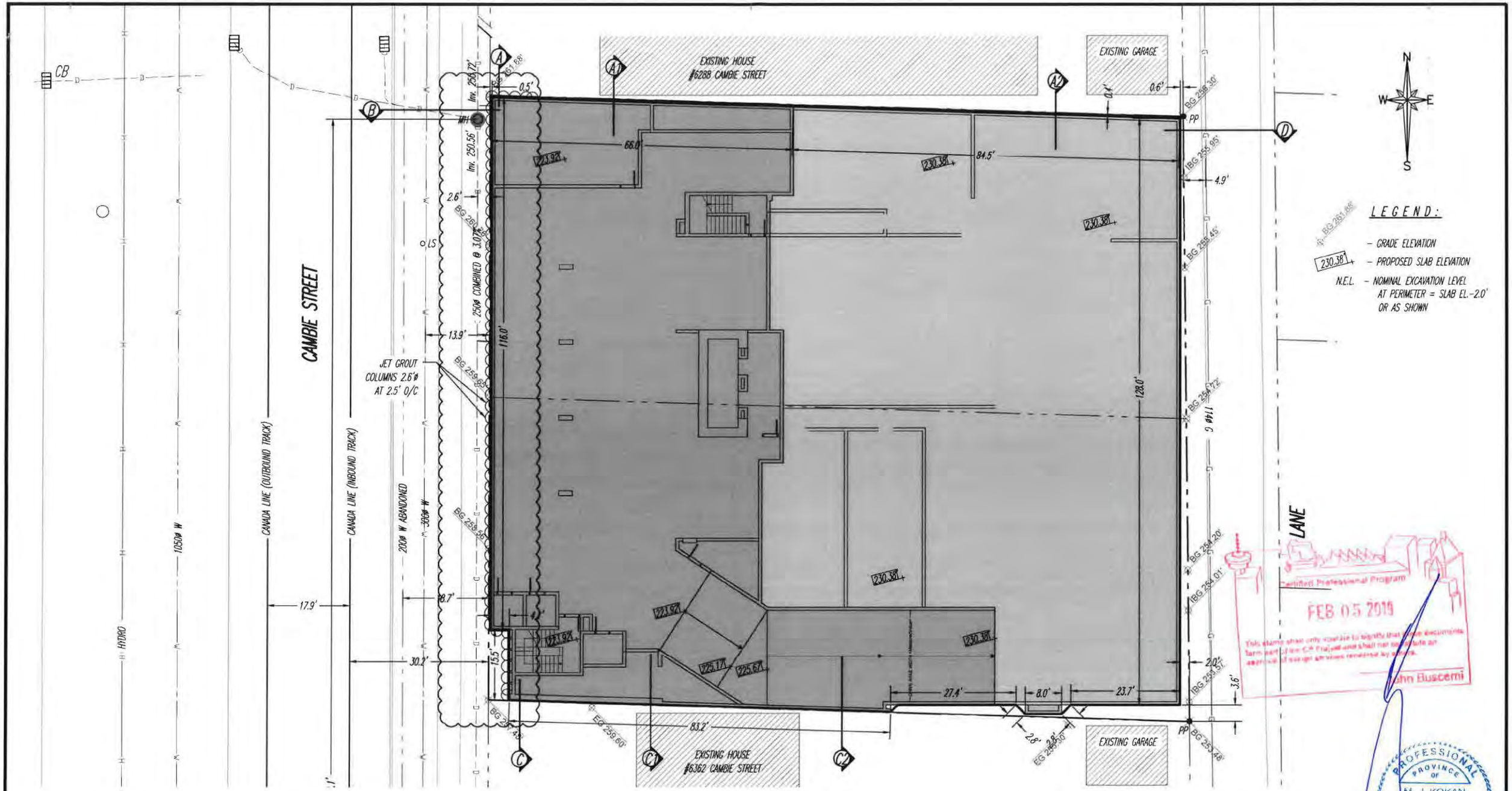
GEOPACIFIC VANCOUVER KAMLOOPS CALGARY
1779 W. 75th Avenue
Vancouver, B.C. V6P 6P2
P 604.439.0922
F 604.439.9189

DATE:	JANUARY 13, 2016	
DRAWN BY: C.T.	APPROVED BY: M.J.K.	REVIEWED BY: M.J.K.
SCALE:	AS SHOWN	

CAMBRIA PARK
54TH & CAMBIE STREET, VANCOUVER, B.C.
SHORING - SECTION D1 & D2

FILE NO.: 12339
DWG. NO.: G-S5B

REVISIONS:
A. FEBRUARY 1 , 2016
B. MARCH 7, 2016 - ISSUED FOR BP STAGE 1
C. APRIL 27, 2016 - ADDED RAKER DESIGN
D. JUNE 14, 2016 - ARCH. UPDATE
E. JUNE 29, 2016
F.
G.



U.G. PARKING/SITE PLAN

SCALE 1"=20'

ISSUED FOR CONSTRUCTION

Certified Professional Program
FEB 05 2019
This stamp shall only operate to signify that these documents form part of the C.P. Program and shall not constitute an approval of design activities rendered by others.
John Buscemi

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
M. J. KOKAN
21364

FEB 0 1 2019

ORIGINAL PAPER SIZE 11"x17"

REFERENCE:
INTEGRA ARCHITECTURA INC.
PROJECT No.: 14331
PROJECT DATE: FEB. 5, 2016

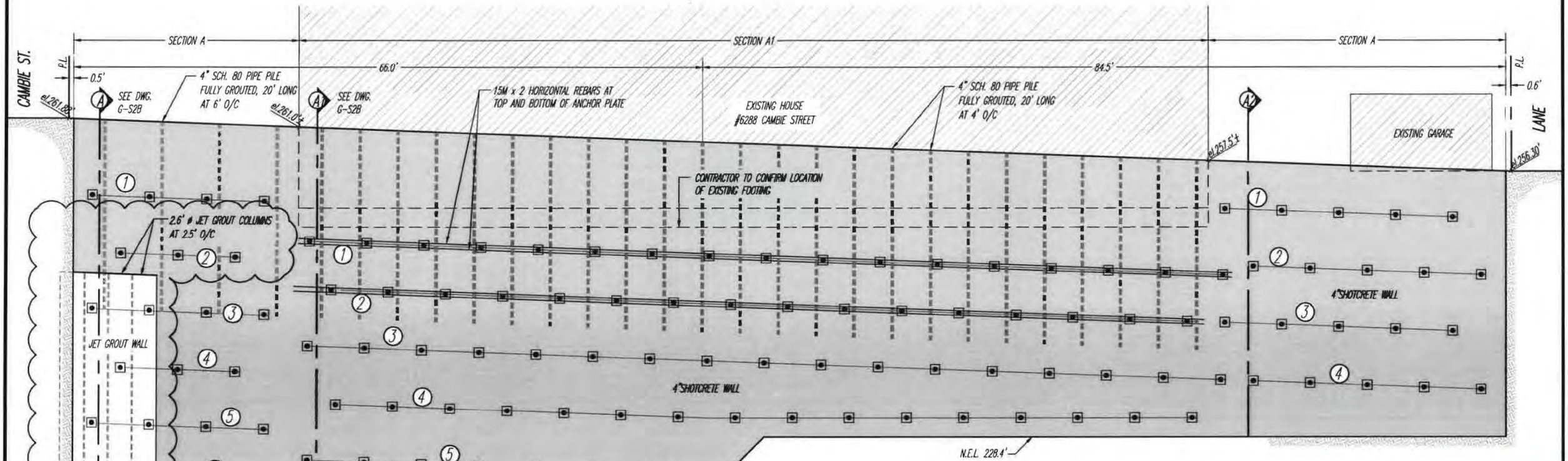
GEOPACIFIC
VANCOUVER KAMLOOPS CALGARY
1779 W. 75th Avenue
Vancouver, B.C. V6P 6P2
P 604.439.0922
F 604.439.9189

DATE: MAY 24, 2017
DRAWN BY: M.S. | APPROVED BY: M.J.K. | REVIEWED BY: L.V.M.
SCALE: AS SHOWN

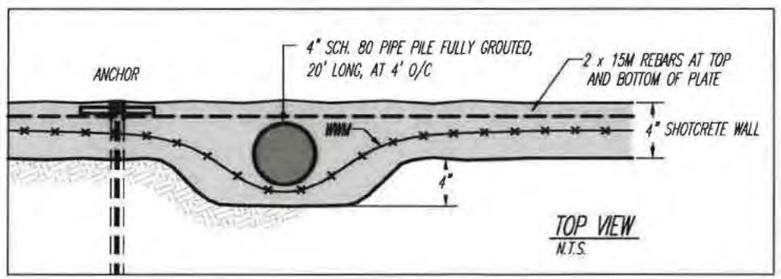
PROPOSED RESIDENTIAL DEVELOPMENT
6318 CAMBIE STREET, VANCOUVER, B.C.
SHORING PLAN

FILE NO.: 13626
DWG. NO.: G-S1

REVISIONS:
A. SEPTEMBER 11, 2017 – PP location (BC Hydro request)
B. SEPTEMBER 21, 2017 – Canada Line and PP location
C. OCTOBER 11, 2017 – South & North shoring design
D. OCTOBER 27, 2017
E. MAY 33, 2018 – North shoring design (N.P.)
F. NOVEMBER 16, 2018 – Ventilation shaft



NORTH ELEVATION
SCALE 1"=10'



TOP VIEW
N.T.S.

LEGEND:

el.123.5'+ – GRADE ELEVATION

N.E.L. – NOMINAL EXCAVATION LEVEL AT PERIMETER = SLAB EL.-2.0' OR AS SHOWN

ISSUED FOR CONSTRUCTION

Certified Professional Program
FEB 05 2019
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John Buscem

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
M. J. KOKAN
21364

FEB 0 1 2019

REFERENCE:
INTEGRA ARCHITECTURA INC.
PROJECT No.: 14331
PROJECT DATE: FEB. 5, 2016

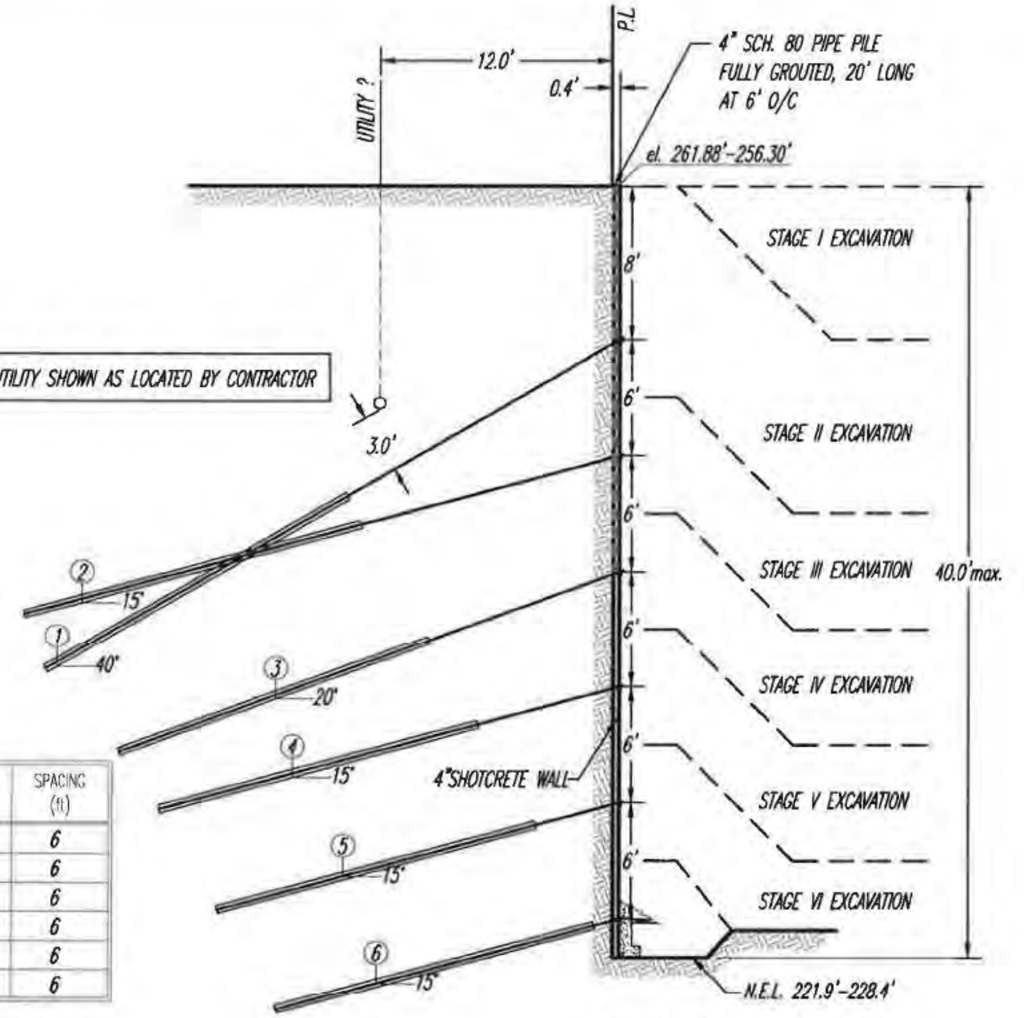
GEOPACIFIC
VANCOUVER KAMLOOPS CALGARY
1779 W. 75th Avenue
Vancouver, B.C. V6P 6P2
P 604.439.0922
F 604.439.9189

DATE: MAY 24, 2017
DRAWN BY: M.S. | APPROVED BY: M.J.K. | REVIEWED BY: L.V.M.
SCALE: AS SHOWN

PROPOSED RESIDENTIAL DEVELOPMENT
6318 CAMBIE STREET, VANCOUVER, B.C.
NORTH ELEVATION

FILE NO.: 13626
DWG. NO.: G-S2A

REVISIONS:
1. JANUARY 25, 2019 – Jet grout wall added
2. OCTOBER 11, 2017 – Bracing design
3. MAY 30, 2018 – Roker system replaced (N.P.)
4. OCTOBER 17, 2018 – Section A & A2



DYWIDAG R32N OR APPROVED ALTERNATE

ROW	LENGTH (ft)	GROUTED (ft)	LOCKOFF (kips)	SPACING (ft)
1	35	18	35	6
2	32	18	34	6
3	28	17	33	6
4	25	17	33	6
5	22	17	33	6
6	19	17	33	6

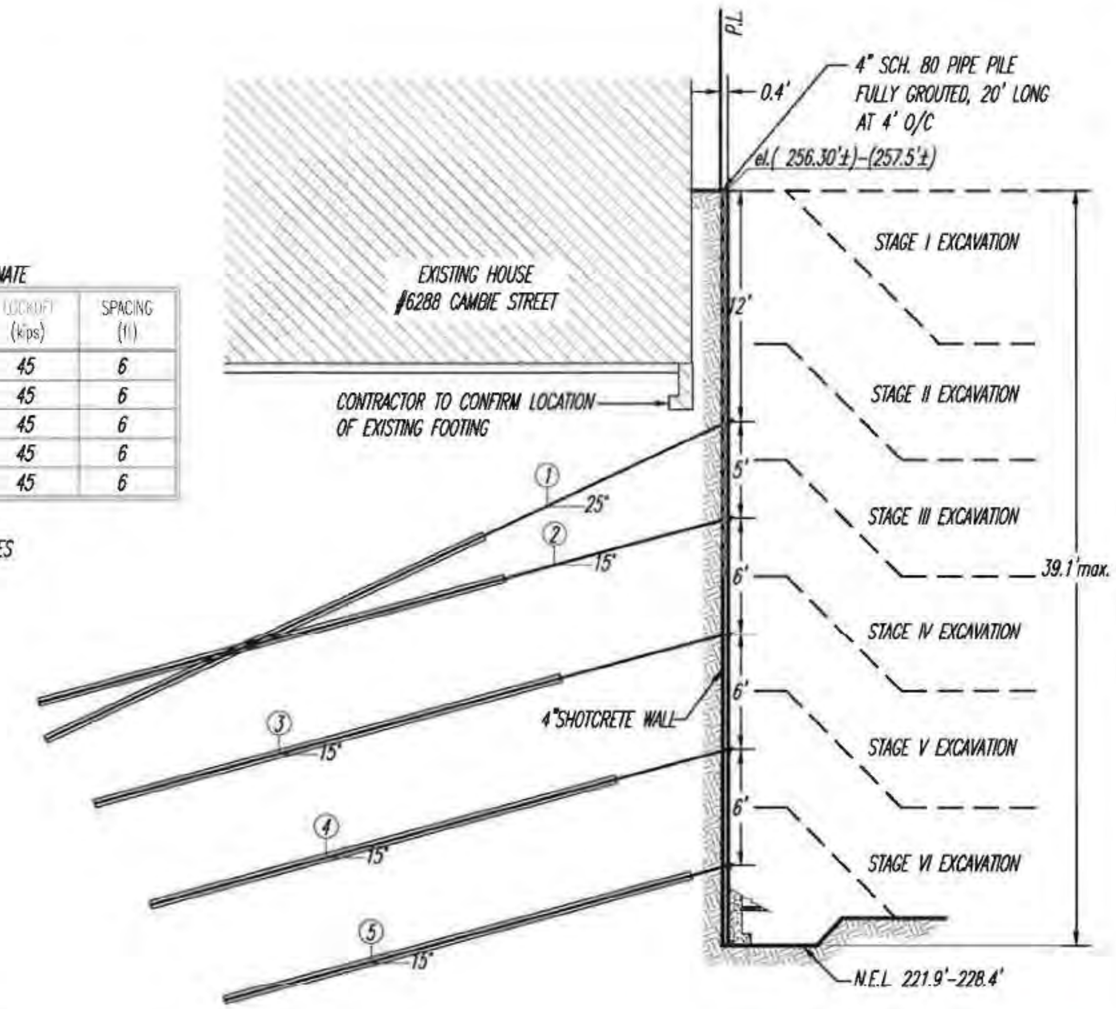
CONTRACTOR TO CONFIRM LOCATION
OF ALL U/G UTILITIES AND STRUCTURES

SECTION A
SCALE 1"=10'

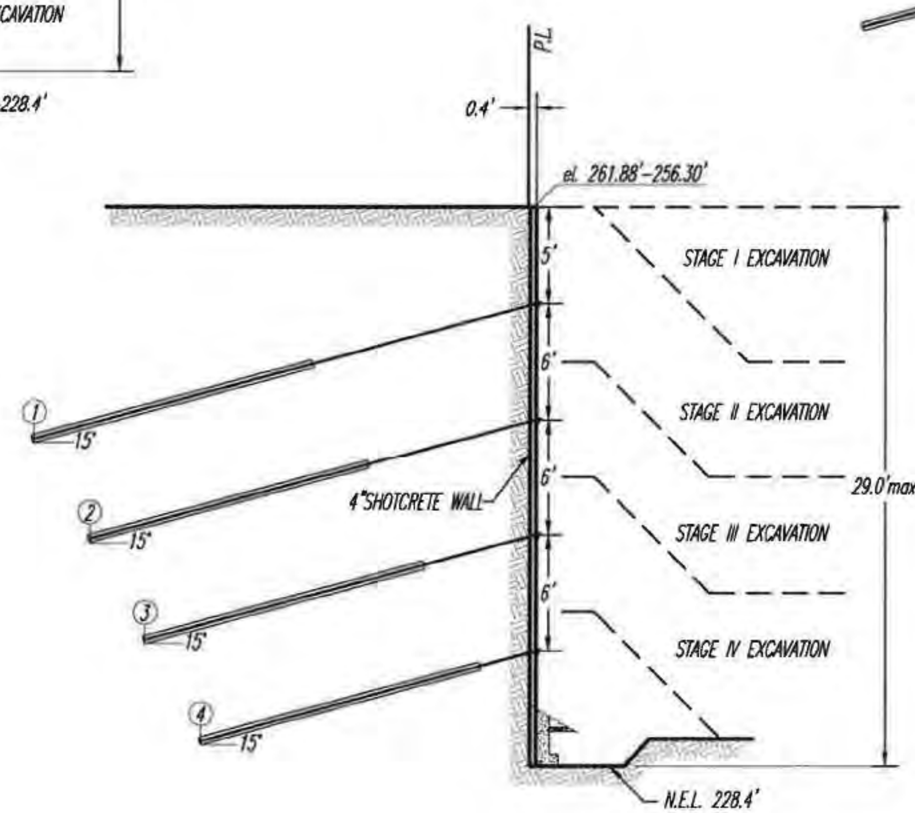
DYWIDAG R38N OR APPROVED ALTERNATE

ROW	LENGTH (ft)	GROUTED (ft)	LOCKOFF (kips)	SPACING (ft)
1	39	25	45	6
2	37	25	45	6
3	34	25	45	6
4	31	25	45	6
5	27	25	45	6

CONTRACTOR TO CONFIRM LOCATION
OF ALL U/G UTILITIES AND STRUCTURES



SECTION A1
SCALE 1"=10'



DYWIDAG R32N OR APPROVED ALTERNATE

ROW	LENGTH (ft)	GROUTED (ft)	LOCKOFF (kips)	SPACING (ft)
1	27	15	25	6
2	24	15	25	6
3	21	15	25	6
4	18	15	25	6

CONTRACTOR TO CONFIRM LOCATION
OF ALL U/G UTILITIES AND STRUCTURES

SECTION A2
SCALE 1"=10'

LEGEND:

- el.123.5' – GRADE ELEVATION
- (6) – NUMBER OF ANCHOR ROW
- N.E.L. – NOMINAL EXCAVATION LEVEL AT PERIMETER = SLAB EL.-2.0' OR AS SHOWN

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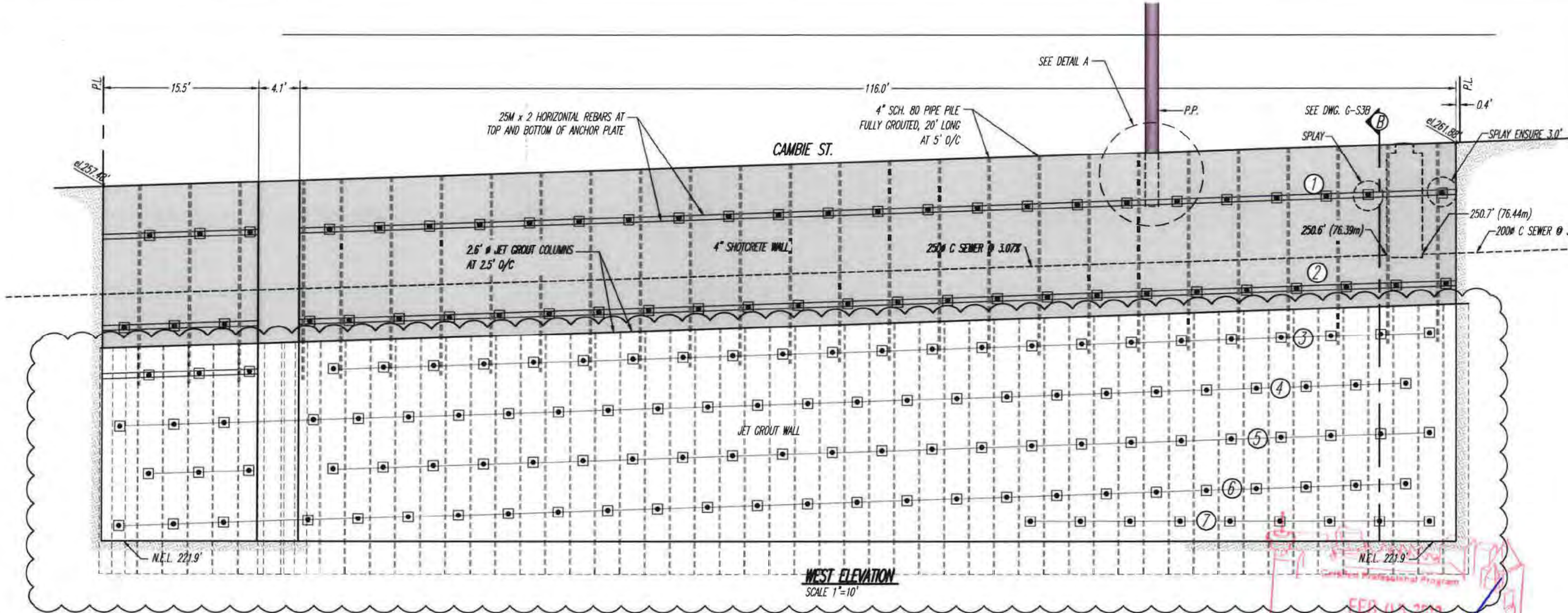
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
M. J. KOKAN
21364

ISSUED FOR CONSTRUCTION

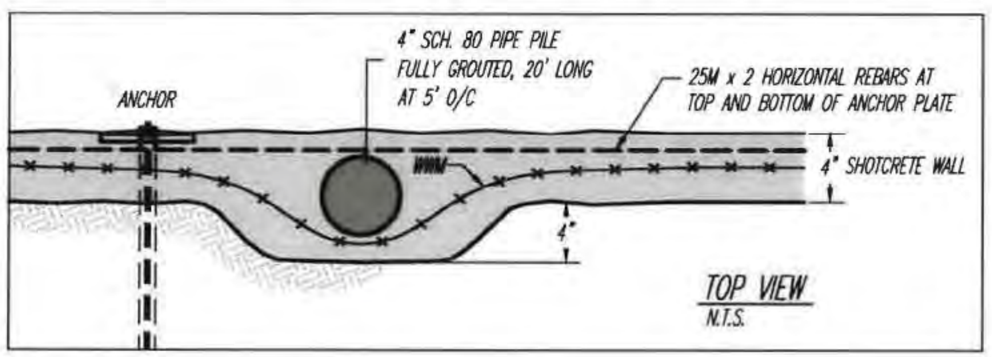
FEB 0 1 2019

REFERENCE:		DATE: MAY 24, 2017	PROPOSED RESIDENTIAL DEVELOPMENT	FILE NO.: 13626	REVISIONS:
INTEGRA ARCHITECTURA INC.	GEOPACIFIC VANCOUVER KAMLOOPS CALGARY	DRAWN BY: M.S. / APPROVED BY: M.J.K. / REVIEWED BY: L.V.M.	6318 CAMBIE STREET, VANCOUVER, B.C.		A. OCTOBER 11, 2017 – Bracing design
PROJECT No.: 14331	1779 W. 75th Avenue Vancouver, B.C. V6P 6P2		SECTIONS A, A1 & A2	DWG. NO.: G-S2B	B. OCTOBER 27, 2017
PROJECT DATE: FEB. 5, 2016	P 604.439.0922 F 604.439.9189	SCALE: AS SHOWN			C. MAY 30, 2018 – Raker system replaced (N.P.)
					D. OCTOBER 17, 2018 – UTILITY (NORTH PROPERTY)

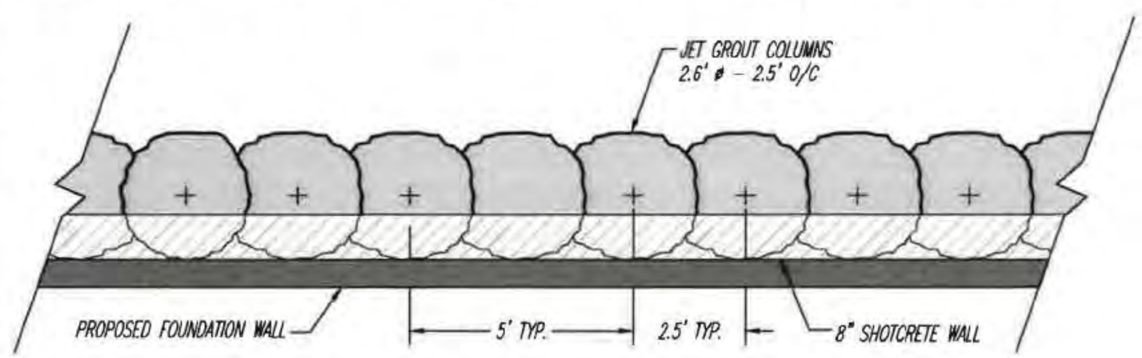
ORIGINAL PAPER SIZE 11"x17"



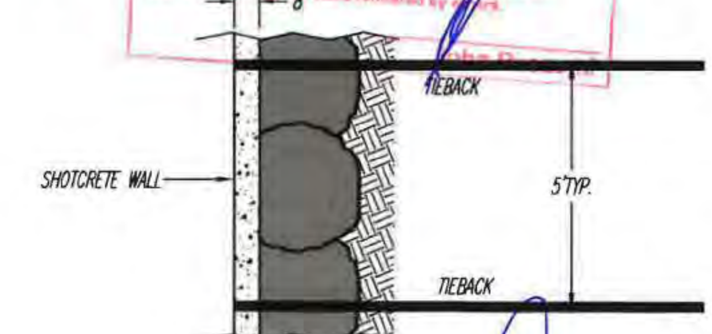
WEST ELEVATION
SCALE 1"=10'



TOP VIEW
N.T.S.



PLAN VIEW-TYPICAL DETAIL
N.T.S.



SHOTCRETE & TIEBACKS
N.T.S.

LEGEND:

el.123.5' - GRADE ELEVATION

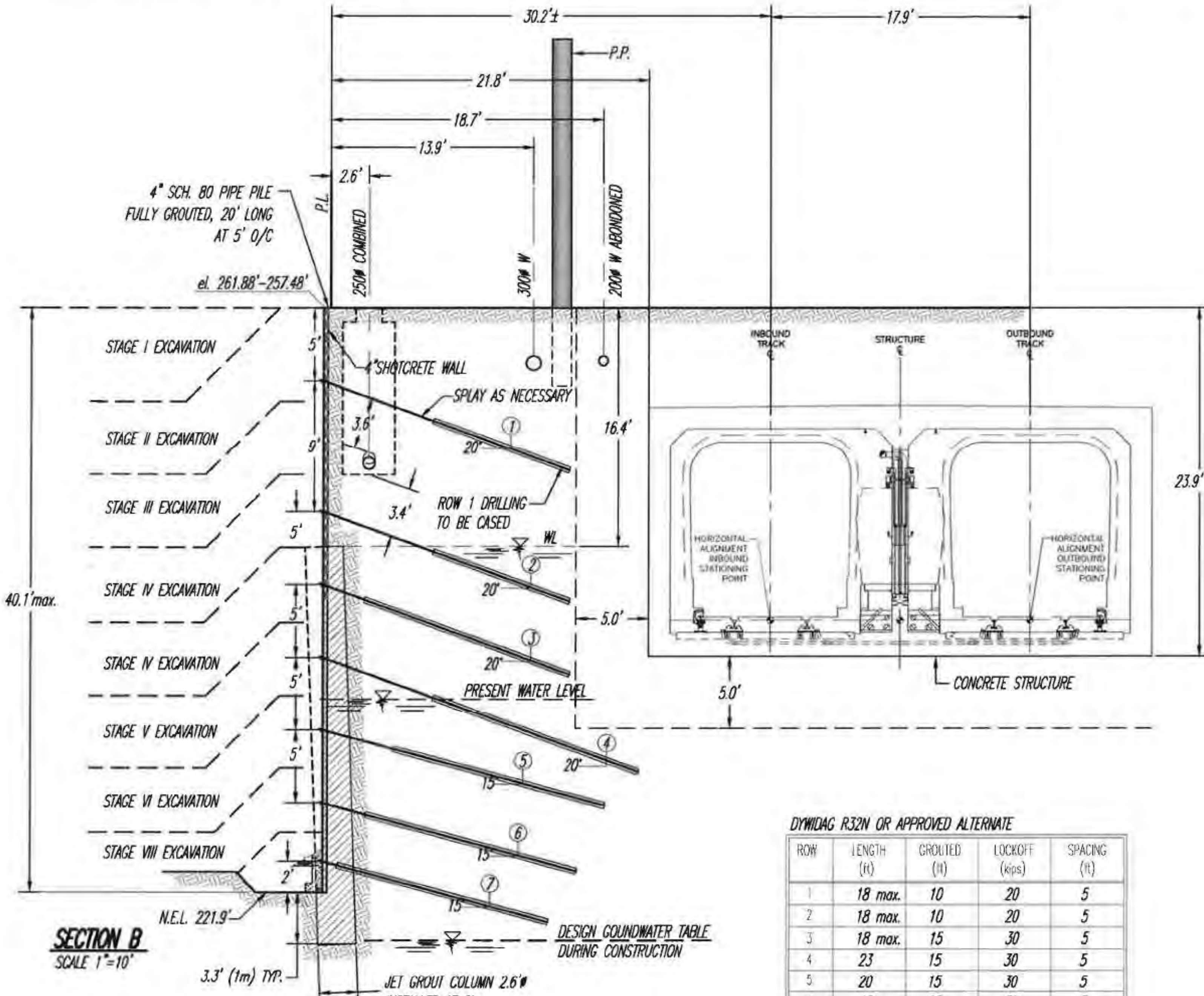
N.E.L. - NOMINAL EXCAVATION LEVEL AT PERIMETER = SLAB EL.-2.0' OR AS SHOWN

ISSUED FOR CONSTRUCTION

City of Vancouver Certified Professional Program
FEB 04 2019
This stamp shall only operate to signify review of documents from part of a CP Project and shall not constitute an approval of design services rendered by others.

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
M. J. KOKAN
21364

REFERENCE: INTEGRA ARCHITECTURA INC. PROJECT No.: 14331 PROJECT DATE: FEB. 5, 2016	GEOPACIFIC VANCOUVER KAMLOOPS CALGARY 1779 W. 75th Avenue Vancouver, B.C. V6P 6P2 P 604.439.0922 F 604.439.9189	DATE: MAY 24, 2017; DRAWN BY: M.S.; APPROVED BY: M.J.K.; REVIEWED BY: L.V.M.; SCALE: AS SHOWN	PROPOSED RESIDENTIAL DEVELOPMENT 6318 CAMBIE STREET, VANCOUVER, B.C. WEST ELEVATION
FILE NO.: 13626	DWG. NO.: G-S3A	REVISIONS: A. SEPTEMBER 11, 2017 - PP location (BC Hydro request); B. OCTOBER 27, 2017; C. JANUARY 25, 2019 Jet grout wall added	FEB 0 1 2019

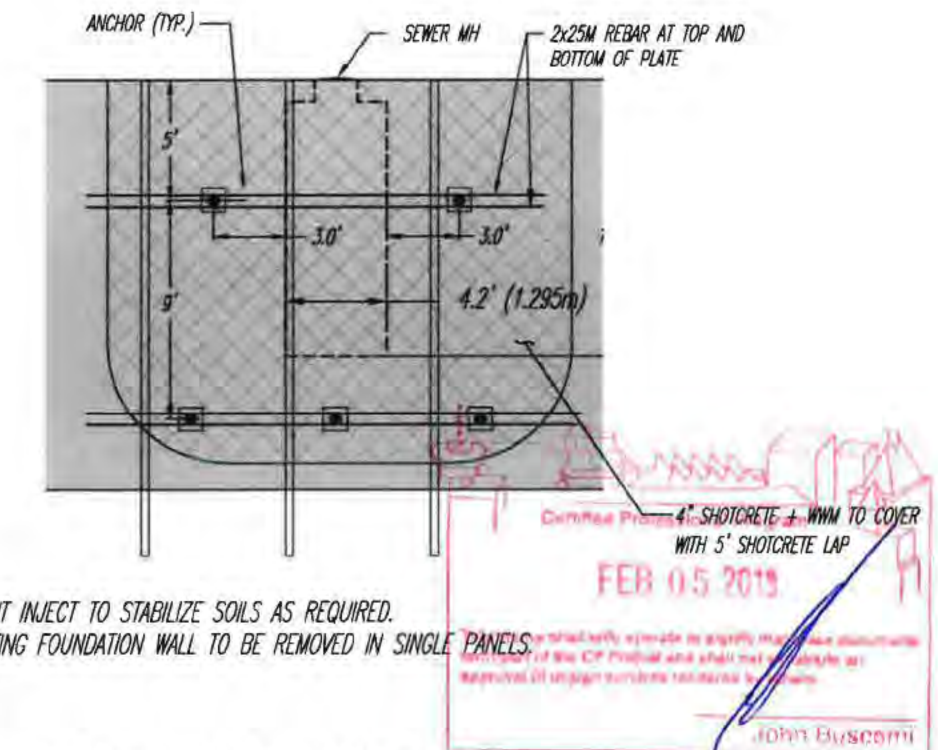


SECTION B
SCALE 1"=10'

DYWIDAG R32N OR APPROVED ALTERNATE

ROW	LENGTH (ft)	GROUTED (ft)	LOCKOFF (kips)	SPACING (ft)
1	18 max.	10	20	5
2	18 max.	10	20	5
3	18 max.	15	30	5
4	23	15	30	5
5	20	15	30	5
6	18	15	30	5
7	16	15	30	5

CONTRACTOR TO CONFIRM LOCATION OF ALL U/G UTILITIES AND STRUCTURES



* GROUT INJECT TO STABILIZE SOILS AS REQUIRED.
* EXISTING FOUNDATION WALL TO BE REMOVED IN SINGLE PANELS.

FEB 0 5 2019
John Buscemi

TYPICAL MANHOLE REINFORCEMENT DETAIL
SCALE 1"=8'

LEGEND:

el.123.5' - GRADE ELEVATION

N.E.L. - NOMINAL EXCAVATION LEVEL AT PERIMETER = SLAB EL.-2.0' OR AS SHOWN

ISSUED FOR CONSTRUCTION

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — M. J. KOKAN # 21364

FEB 0 1 2019

REFERENCE:
INTEGRA ARCHITECTURA INC.
PROJECT No.: 14331
PROJECT DATE: FEB. 5, 2016

GEOPACIFIC — VANCOUVER KAMLOOPS CALGARY
1779 W. 75th Avenue Vancouver, B.C. V6P 6P2
P 604.439.0922
F 604.439.9189

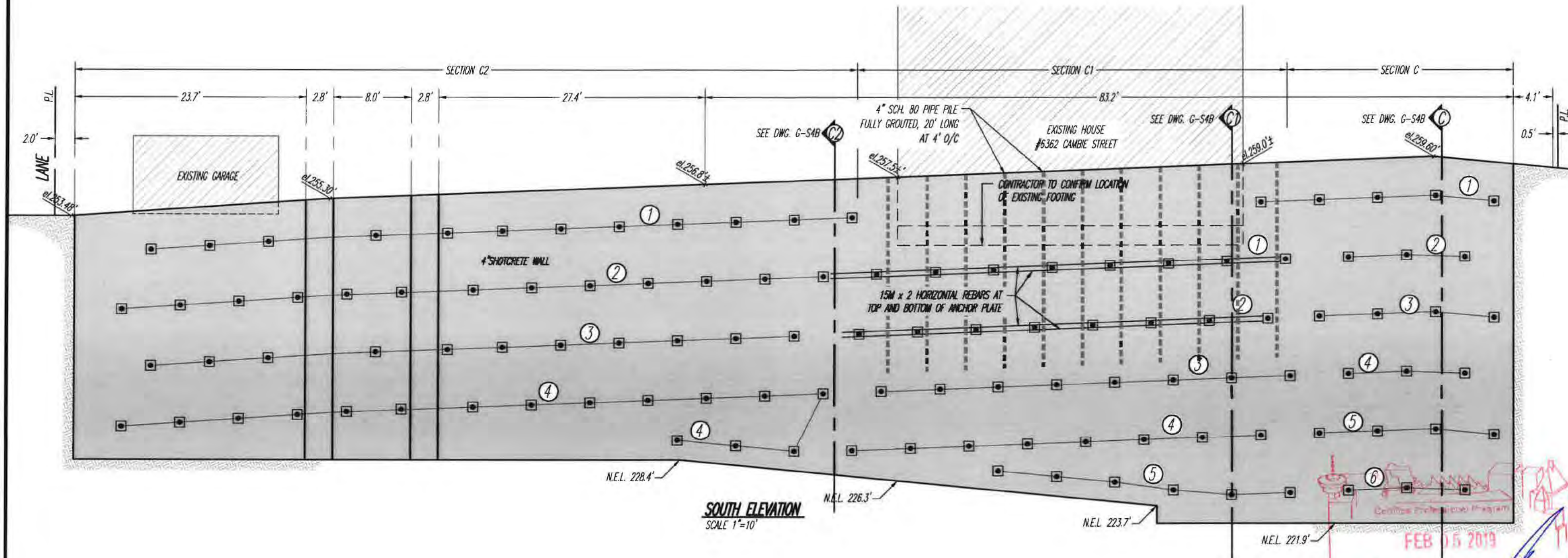
DATE: MAY 24, 2017
DRAWN BY: M.S. | APPROVED BY: M.J.K. | REVIEWED BY: L.V.M.
SCALE: AS SHOWN

PROPOSED RESIDENTIAL DEVELOPMENT
6318 CAMBIE STREET, VANCOUVER, B.C.
SECTION B

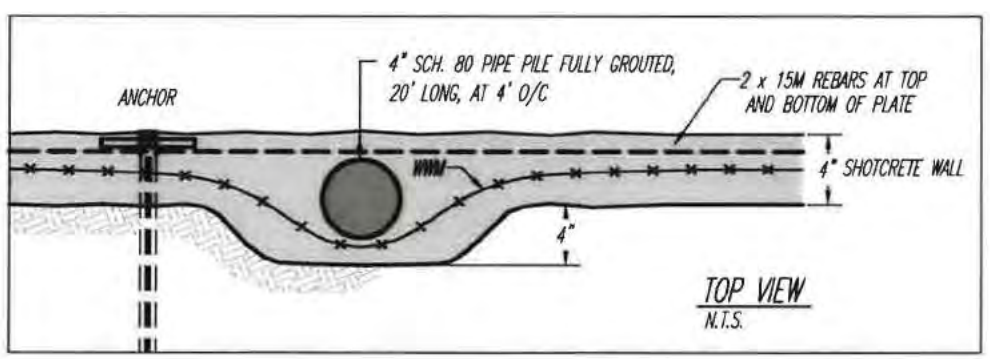
FILE NO.: 13626
DWG. NO.: G-S3B

REVISIONS:
A. SEPTEMBER 11, 2017 – PP location (BC Hydro request)
B. SEPTEMBER 21, 2017 – Canada Line location
C. NOVEMBER 16, 2017 – Well point, manhole reinforcement
D. APRIL 30, 2018 – Manhole reinforcement
E. JANUARY 25, 2019 – Jet grout wall added

ORIGINAL PAPER SIZE 11"x17"



SOUTH ELEVATION
SCALE 1"=10'



TOP VIEW
N.T.S.

LEGEND:

el.123.5' - GRADE ELEVATION

N.E.L. - NOMINAL EXCAVATION LEVEL
AT PERIMETER = SLAB EL.-2.0'
OR AS SHOWN

Certified Professional Program
FEB 05 2019
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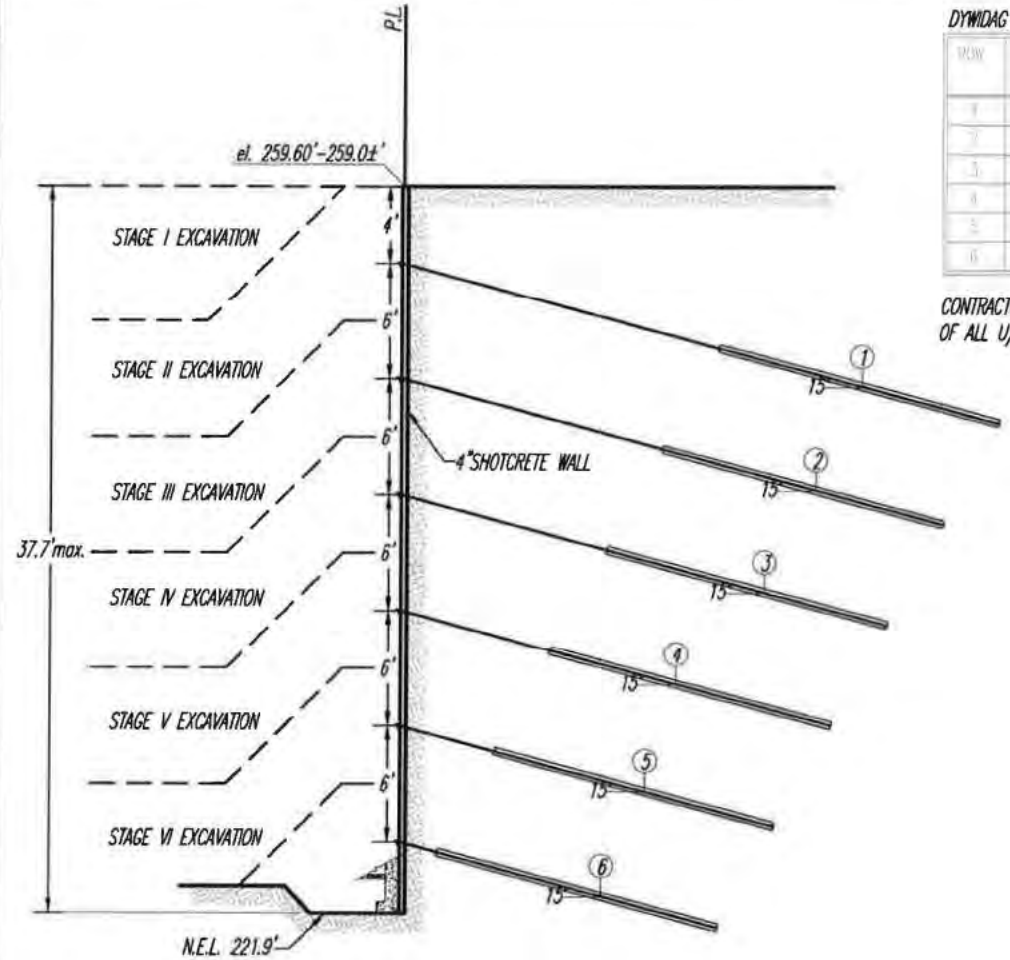
ISSUED FOR CONSTRUCTION

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
M. J. KOKAN
21364

FEB 0 1 2019

REFERENCE:		DATE: MAY 24, 2017			PROPOSED RESIDENTIAL DEVELOPMENT	FILE NO.: 13626	REVISIONS:
INTEGRA ARCHITECTURA INC.	GEOPACIFIC VANCOUVER KAMLOOPS CALGARY 1779 W. 75th Avenue Vancouver, B.C. V6P 6P2 P 604.439.0922 F 604.439.9189	DRAWN BY: M.S.	APPROVED BY: M.J.K.	REVISED BY: L.V.M.	6318 CAMBIE STREET, VANCOUVER, B.C.		A. OCTOBER 11, 2017 - Bracing design
PROJECT No.: 14331		SCALE: AS SHOWN			SOUTH ELEVATION	DWG. NO.: G-S4A	B. OCTOBER 27, 2017
PROJECT DATE: FEB. 5, 2016							C. NOVEMBER 16, 2018 - Ventilation Shaft

ORIGINAL PAPER SIZE 11"x17"

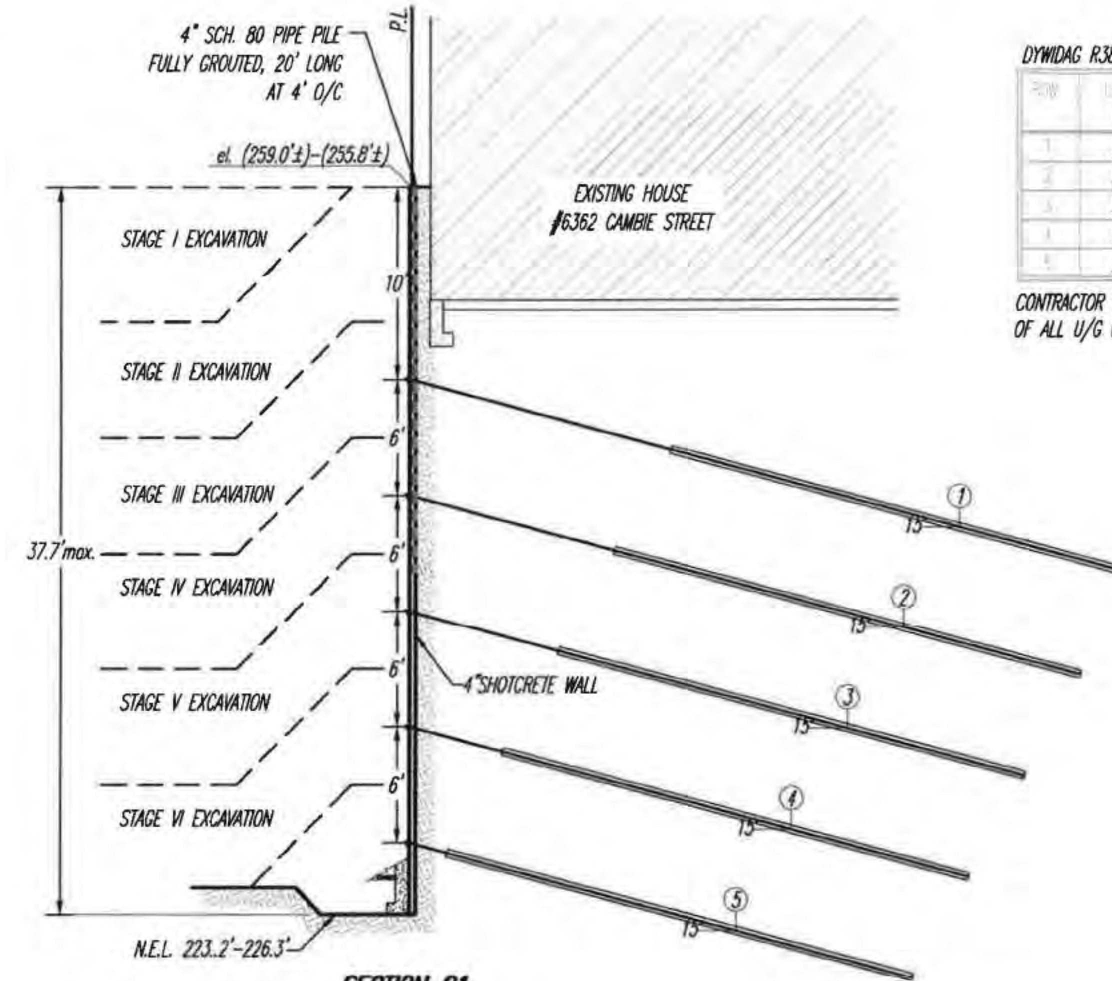


SECTION C
SCALE 1"=10'

DYWIDAG R32N OR APPROVED ALTERNATE

ROW	LENGTH (ft)	GROUTED (ft)	CAPACITY (kips)	SPACING (ft)
1	33	15	28	6
2	30	15	28	6
3	27	15	28	6
4	24	15	28	6
5	21	15	28	6
6	18	15	28	6

CONTRACTOR TO CONFIRM LOCATION
OF ALL U/G UTILITIES AND STRUCTURES

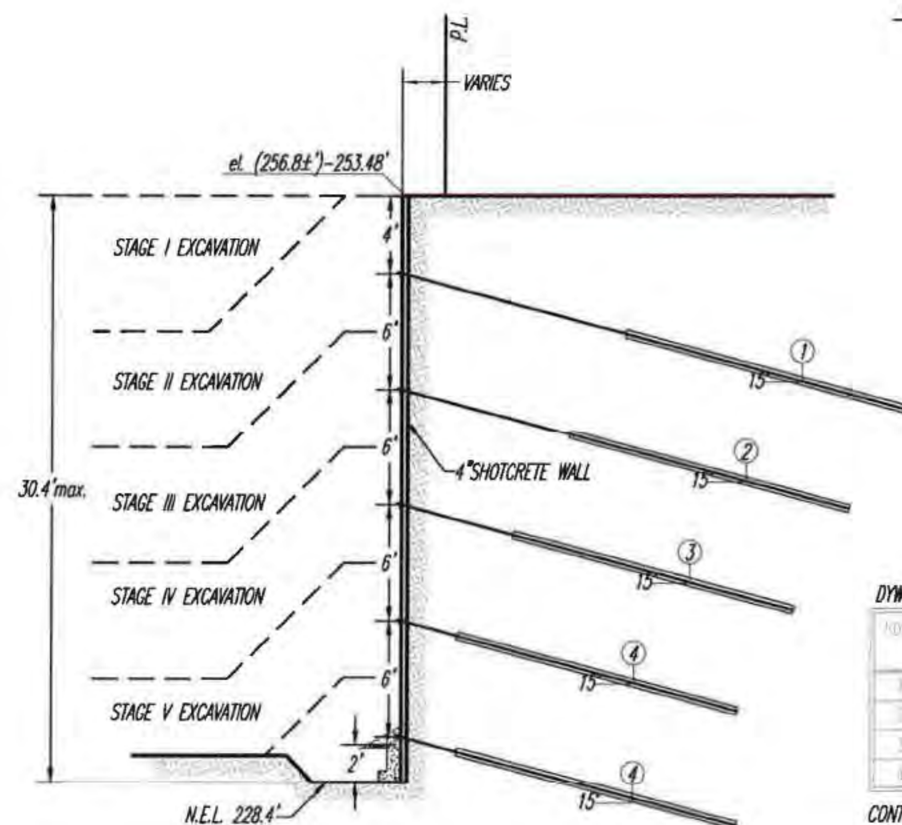


SECTION C1
SCALE 1"=10'

DYWIDAG R38N OR APPROVED ALTERNATE

ROW	LENGTH (ft)	GROUTED (ft)	CAPACITY (kips)	SPACING (ft)
1	39	25	45	6
2	36	25	45	6
3	33	25	45	6
4	30	25	45	6
5	27	25	45	6

CONTRACTOR TO CONFIRM LOCATION
OF ALL U/G UTILITIES AND STRUCTURES



SECTION C2
SCALE 1"=10'

DYWIDAG R32N OR APPROVED ALTERNATE

ROW	LENGTH (ft)	GROUTED (ft)	CAPACITY (kips)	SPACING (ft)
1	27	15	25	6
2	24	15	25	6
3	21	15	25	6
4	18	15	25	6

CONTRACTOR TO CONFIRM LOCATION
OF ALL U/G UTILITIES AND STRUCTURES

LEGEND:

el.123.5' – GRADE ELEVATION

N.E.L. – NOMINAL EXCAVATION LEVEL AT PERIMETER = SLAB EL.–2.0' OR AS SHOWN

ISSUED FOR CONSTRUCTION

Certified Professional Program
FEB 05 2019
John Buscemi

PROFESSIONAL PROVINCE OF BRITISH COLUMBIA
M. J. KOKAN
21364
ENGINEER

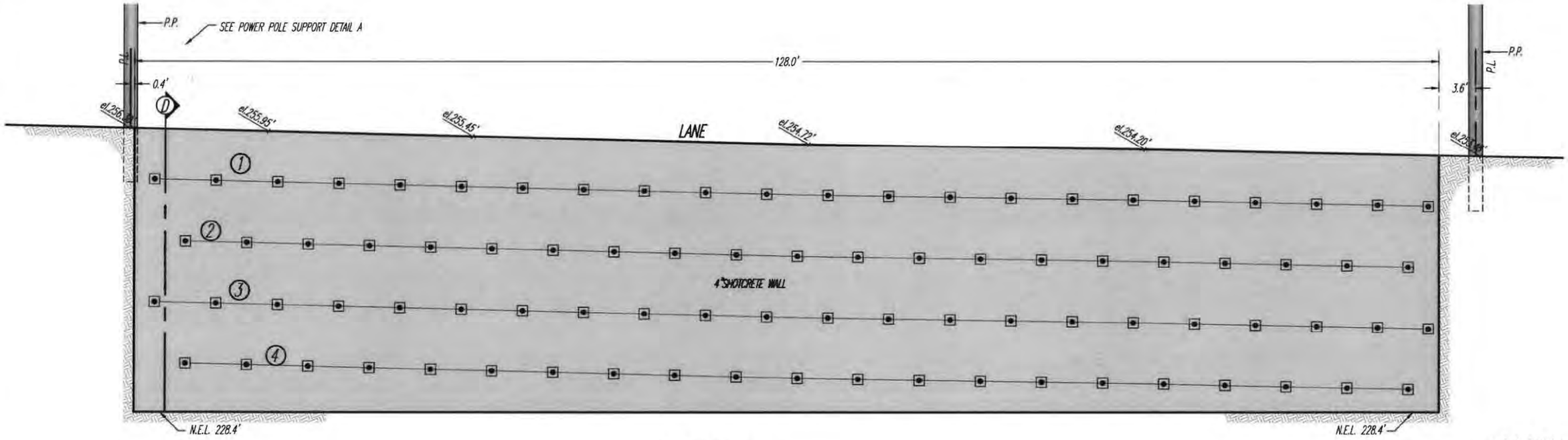
REFERENCE: INTEGRA ARCHITECTURA INC. PROJECT No.: 14331 PROJECT DATE: FEB. 5, 2016	GEOPACIFIC VANCOUVER KAMLOOPS CALGARY 1779 W. 75th Avenue Vancouver, B.C. V6P 6P2 P 604.439.0922 F 604.439.9189	DATE: MAY 24, 2017 DRAWN BY: M.S. APPROVED BY: M.J.K. REVIEWED BY: L.V.M. SCALE: AS SHOWN

PROPOSED RESIDENTIAL DEVELOPMENT
6318 CAMBIE STREET, VANCOUVER, B.C.
SECTION C, C1 & C2

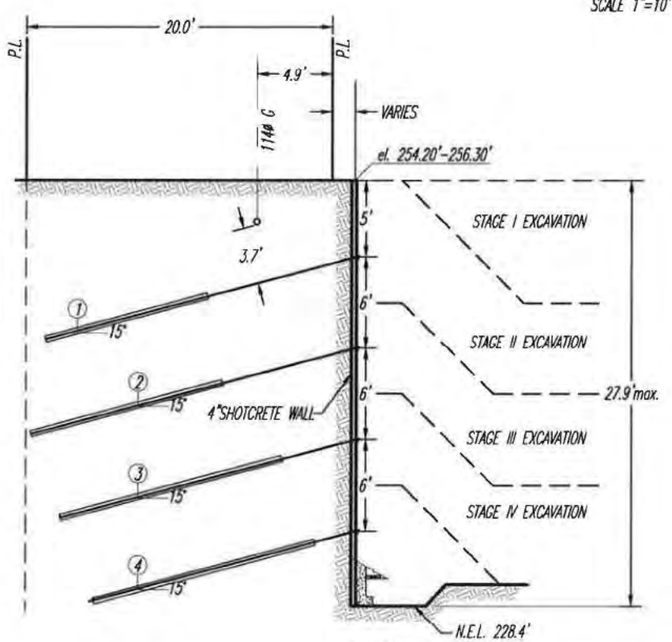
FILE NO: 13626
DWG NO: G-S4B

REVISIONS:
A. OCTOBER 11, 2017 – Bracing design
B. OCTOBER 27, 2017
C. OCTOBER 17, 2018

FEB 0 1 2019



EAST ELEVATION
SCALE 1"=10'

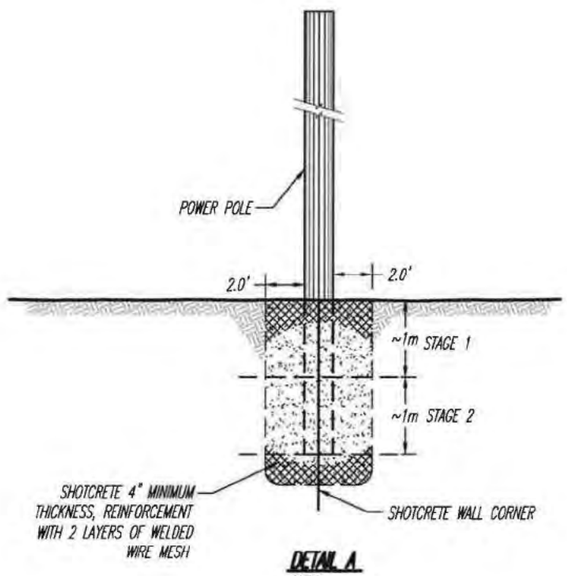


SECTION D
SCALE 1"=10'

DYWIDAG R32N OR APPROVED ALTERNATE

ROW	LENGTH (ft)	GROUTED (ft)	LOCKOFF (kips)	SPACING (ft)
1	21	11	20	6
2	22	13	20	6
3	20	15	20	6
4	18	15	20	6

CONTRACTOR TO CONFIRM LOCATION OF ALL U/G UTILITIES AND STRUCTURES



DETAIL A
N.T.S.

LEGEND:

el. 123.5' – GRADE ELEVATION

N.E.L. – NOMINAL EXCAVATION LEVEL AT PERIMETER = SLAB EL.-2.0' OR AS SHOWN

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FEB 05 2019

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PROVINCE OF BRITISH COLUMBIA
M. J. KOKAN
21364

FEB 0 1 2019

City of Vancouver FOI 2019-042 - Page 8 of 44 - Part 4 of 4

ORIGINAL PAPER SIZE 11"x17"

REFERENCE:
INTEGRA ARCHITECTURA INC.
PROJECT No.: 14331
PROJECT DATE: FEB. 5, 2016

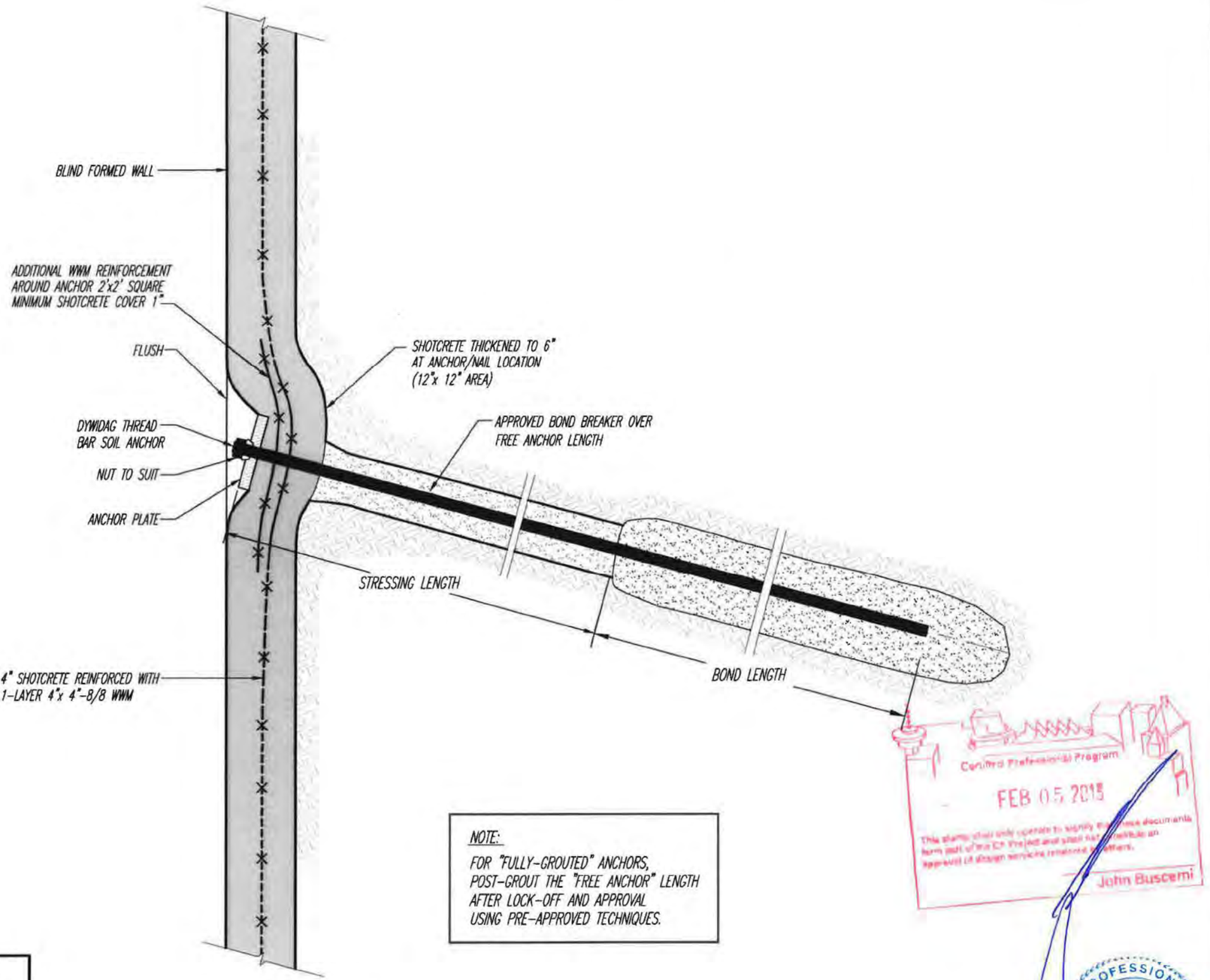
GEOPACIFIC
VANCOUVER KAMLOOPS CALGARY
1779 W. 75th Avenue
Vancouver, B.C. V6P 6P2
P 604.439.0922
F 604.439.9189

DATE: MAY 24, 2017
DRAWN BY: M.S. | APPROVED BY: M.J.K. | REVIEWED BY: L.V.M.
SCALE: AS SHOWN

PROPOSED RESIDENTIAL DEVELOPMENT
6318 CAMBIE STREET, VANCOUVER, B.C.
EAST ELEVATION, SECTION D

FILE NO.: 13626
DWG. NO.: G-S5

REVISIONS:
A. SEPTEMBER 11, 2017 – PP location (BC Hydro request)
B. SEPTEMBER 27, 2017 – PP location (BC Hydro request)
C. JANUARY 19, 2018 – PP support (BC Hydro request)



NOTE:

FOR "FULLY-GROUTED" ANCHORS, POST-GROUT THE "FREE ANCHOR" LENGTH AFTER LOCK-OFF AND APPROVAL USING PRE-APPROVED TECHNIQUES.

ISSUED FOR CONSTRUCTION

ANCHORED SHOTCRETE DETAIL

N.T.S.

Confined Professional(s) Program

FEB 05 2019

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PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
M. J. KOKAN
21364

FEB 01 2019

REFERENCE:	GEOPACIFIC VANCOUVER KAMLOOPS CALGARY 1779 W. 75th Avenue, Vancouver, B.C. V6P 6P2 P 604.439.0922 F 604.439.9189	DATE: MAY 24, 2017 DRAWN BY: M.S. / APPROVED BY: M.J.K. / REVIEWED BY: L.V.M. SCALE: AS SHOWN	GENERAL ANCHORED SHOTCRETE DETAILS
FILE NO.:	DWG. NO.: G-1	REVISIONS: A. B. C.	

1.0 GENERAL

1.1 In these Notes, the Engineer is GeoPacific Consultants Ltd.

1.2 These Notes must be read in conjunction with the design Drawings.

1.3 The work described and shown involves near vertical excavated slopes or structure using a combination of shotcrete and ground anchors. All slopes shall be covered with secured polyethylene sheeting to prevent erosion.

1.4 The anchors will be installed in ground around the site and the actual soil and groundwater conditions must be assumed.

1.5 The grouted anchor lengths required to resist the design loads are based on the assumed conditions. The capacity of the anchors will be confirmed at the beginning of the contract and may be lengthened or shortened.

1.6 Some utilities, foundations and structures which may affect the installation procedures and techniques are noted on the Drawings.The Contractor shall confirm the locations and condition of ALL man-made elements which may be damaged because of the anchored shotcrete operations. It is the Contractor's responsibility to install the anchored shotcrete in the actual site conditions encountered.

Elements which may, in the opinion of the Contractor, be damaged by the anchored shotcrete operations must be reported to the Engineer well in advance of the work to take place.

1.7 These documents are based on architectural, structural and survey Drawings provided. It is the Contractor's responsibility to verify all dimensions and report discrepancies to the Engineer.

1.8 The Contractor shall schedule and co-ordinate the work to satisfy the reasonable requirements of adjacent Owners and Tenants who shall be given sufficient Notice before carrying out work which may affect their property.

1.9 The Contractor shall erect and maintain a secure closed hoarding around the site for the safety of all persons in the vicinity of the site.

1.10 The Contractor shall inspect the slopes and the support to the slopes and structures daily and shall immediately report any potentially damaging movement or deterioration to the Engineer by telephoning 604-439-0922.

2.0 MATERIALS

2.1 ANCHOR BAR:

The anchors shall be installed in minimum 75 mm (3 inch) diameter holes which shall be drilled, unless otherwise approved in advance by the Engineer. Anchor capacity is dependant upon installation techniques and the drilling equipment and methods shall be subject to the Engineer's approval.

Drilling techniques shall produce a hole which is free of debris and ensure continuous support of the hole and shall not erode or disturb soil around the hole.

2.2 Anchor tendons shall be as shown on the design drawings.

Anchorage equipment couplings and any necessary wedges washers and plates shall be in accordance with the tendon manufacturer's specifications and requirements.

Minimum anchorage length ("fixed" length) and stressing length ("free" length) are shown on the Drawings.

2.3 Grout in the anchorage shall be a prior-approved non-shrink cementitious material mixed with a minimum compressive strength of 5 MPa in 24 hours and 35 MPa in 28 days.

2.4 Shotcrete shall be reinforced with 102 x 102 MW13.3/13.3 (4"x4"-8/8) welded wire mesh as shown on the Drawings. Steel shall have a minimum yield strength of 450 MPa (65 ksi) and shall be in accordance with ASTM A497.

2.5 All shotcreting shall be carried out in accordance with ACI 506 : "Specifications for Materials Proportioning and Application of Shotcrete"

2.6 Shotcrete shall have a minimum compressive strength of 5 MPa in 24 hours and 30 MPa in 28 days. The Engineer may require test panels to be prepared by the Contractor so they can be cored by others to confirm the shotcrete strength. The Contractor shall co-operate with the independent testing laboratory appointed by the Owner for this purpose.

3.0 INSTALLATION

3.1 Hollow Core Bar Installation (if required)

Set the bar on an appropriate drill rig. Start pumping the grout to assure that grout will exit drill bit.

Proceed with rotary drilling and flushing approx. three feet per min (depending on ground condition). Rotation speed should be approx. 60 to 120 RPM. To achieve higher friction values, advance and retract the bars several times for each 3.0 m (10 feet) length of bar installed in the bond zone.

The grout should be applied CONTINUOUSLY during drilling. A grout pump with at least 60 l/min volume and minimum 2 MPa (300 psi) pressure capacity (preferably 10 MPa, 1500 psi) should be used.

Refer to the manufacture's specifications and recommendations for more detail.

3.2 Anchors and shotcrete shall be installed in sequence and stages to maintain stability of the excavation. Excavation of soil from the site shall also take place in stages. Stages shall not exceed 1.8 m (6 feet) vertical.

The Contractor may remove all soil within any mass excavation Stage before anchors in that Stage are installed but further excavation shall not take place until all anchored shotcrete in that Stage is installed and approved by the Engineer.

The mass excavation for any Stage does not include a perimeter berm with a minimum top width of one metre and a side slope of 1 horizontal to 1 vertical.

Ground conditions may locally require a wider berm, flatter slopes and/or other slope protection measures including covering or short-term temporary support.

The perimeter berms in any stage shall be excavated in staggered panels. THE MAXIMUM WIDTH OF A PANEL SHALL BE THE HORIZONTAL SPACING OF THE ANCHOR PLUS 0.6 M (2 FEET). This panel width may be INCREASED OR DECREASED by the Engineer's agreement, in writing, BEFORE increasing the panel width.

No adjacent panels shall be excavated concurrently and no more than 1/3 of the panels shall be excavated concurrently. In addition no panel shall be excavated into the berm until at least 24 hours after that panel anchor has been grouted.

Anchors and shotcrete may be installed concurrently in different panels. Anchors shall be installed at right angles to the property lines on plan and within 2.5 degrees of the declination shown on the Drawings except with the prior approval of the Engineer.

ISSUED FOR CONSTRUCTION

REFERENCE:	GEOPACIFIC VANCOUVER KAMLOOPS CALGARY 1779 W. 75th Avenue Vancouver, B.C. V6P 6P2 P 604.439.0922 F 604.439.9189	SCALE: -	GENERAL NOTES	FILE NO.: DWG. NO.: G-2 (SHEET 1 OF 2)	REVISIONS: A. B. C.

3.3 Immediately following excavation of the soil berm in a panel the excavated face shall be trimmed back to the required line and mesh reinforcement shall be fixed to the soil to ensure the minimum specified shotcrete cover. Shotcrete shall be applied without delay to thicknesses shown on the Drawings.

Shotcrete panels shall be kept moist to aid curing by spraying with water and covering with sacking or polyethylene sheeting.

Sufficient wire mesh reinforcement shall be installed to provide a full strength overlap with adjacent panels. This overlap shall not be less than 200 mm (8 inch).

The end surfaces of panels shall be thoroughly cleaned with compressed air to ensure a full strength bond when adjacent panels are shotcreted.

3.4 Drains to relieve groundwater pressure shall be installed through the shotcrete. Drains shall be a minimum of 50 mm (2 inches) diameter and at normal 3.0 m (10 feet) centres horizontally and 1.5 m (5 feet) centres vertically. The Contractor shall install filters in drains as fines are being removed with the water.

Additional special drains may be required where water seeps are noted. This special drains shall consist of minimum 50 mm (2 inches) diameter perforated ABS pipe installed within 75 mm (3 inches) diameters holes drilled 5 degrees UPWARDS from the 3 metres (10 feet) measured from the face of the shotcrete. These special drains may be required to be filtered with fine sand or gravel or filter fabrics.

3.5 Anchors shall be tensioned as soon as practicable but no sooner than 24 hours after the construction of the applicable shotcrete panel. Anchors shall be tensioned and tested as follows:

3.5.1 Apply a proof load of 1.33 times the lock-off load for two minutes. Monitor the load in the anchor. If the reduction in load is less than 2.5 percent of proof load reduce the load to lock-off load and lock the working load into the anchor.

3.5.2 If the anchor does not hold at least 133 percent of lock-off load for two minutes the Engineer must be informed. Further testing in the presence of the Engineer will required as follows:

Load the anchor in 22 kN (5 kip) increments to 130.5 percent of lock-off load. Hold each increment for 5 minutes except at maximum load when the load shall be maintained for 100 minutes. The increase in length of the anchor shall be measure at the start and end of each load increment except at maximum load when the extension shall be measured at 5 minutes intervals.

This information shall be utilized by the Engineer to deduce the utilized anchor length and to assess the creep characteristics.

Anchors which creep more than 2 mm (0.08 inch) per log cycle of time will not be accepted. The Contractor shall install replacement anchors at the Contractor's expense.

4.0 SHOTCRETE REMOVAL/ANCHOR DETENSIONING

4.1 All excavation and support works within the CITY OF VANCOUVER shall be in strict accordance with the City's requirements.

4.2 No part of the anchor system shall remain in place within 1.5 m (5 feet) of final grade. Anchors 1.5 m (5 feet) below final grade shall be detensioned or fully grouted when no longer required in the opinion of the Engineer.

4.3 No shotcrete shall remain in place within 1.5 m (5 feet) of final grade. A bond breaker must be installed between blind-formed foundation walls and shotcrete on city property to allow for shotcrete removal.

5.0 BACKFILLING ON AND ADJACENT TO CITY PROPERTY

5.1 Backfilling on and adjacent to City property must be in accordance with the City's backfill specifications, with the City's backfill specifications, "Street Restoration Manual" dated AUGUST 18, 2008.

5.2 Backfill Containment dams will be required at excavation corners where excavation to be backfilled against City property.

6.0 REQUIRED INSPECTIONS

6.1 The following are the MINIMUM inspections which are required by the Geotechnical Engineer. The Contractor is responsible for informing the Geotechnical Engineer that the Work is ready for these inspections. The Contractor shall be liable for any loss caused by failure to inform the Geotechnical Engineer that the Work is ready for inspection.

1. 2 days before work commences on site.
2. 1 day before the anchors are detensioned.
3. 2 days before backfilling commences.
4. 1 day before shotcrete removal.

6.2 Daily Inspection is required during installation of anchors, and full time inspection is required during anchor testing.

7.0 CONTRACTOR QUALIFICATION

7.1 Temporary works and shoring installation is highly sensitive to processes including sequence of installation, quality and quantity of materials used, monitoring of the works and other factors. Consequently a high degree of skill and professionalism is required for its successful implementation. As a result, all contractors considered for tender of the shoring work described in the Design Drawings must be approved by the Engineer in advance of tender. The work must be carried out only by a shoring contractor with experience and expertise in shoring construction. The contractors experience and expertise must be with projects of similar size and scope to that shown in the Design Drawings. The following shoring contractors are permitted to undertake the work:

- Matcon Canada
- Southwest Contracting
- Bel Pacific Excavation & Shoring
- Vancouver Shotcrete
- Power Shotcrete Shoring LTD.
- Mainland Excavation & Shoring ltd.

7.2 The preceding list does not express or imply any guarantee or warranty of the contractor's performance. It is the responsibility of the contractor to undertake the work shown on the Design Drawings.

7.3 Shoring contractors other than those listed above may be considered by the Engineer only with submission of references and qualifications for at least 10 projects of similar size and scope. GeoPacific reserves the right to accept or reject the qualifications of any shoring contractor.

NOTES:

1. The excavation support design is based on the locations of adjacent structures and utilities which have been supplied. The Contractor shall confirm the locations and elevations of all foundations and utilities which may be affected by the work and raport any discrepancies to GeoPacific Consultants Ltd. (Tel.: 604-439-0922)
2. All slopes shall be covered with secured polyethylene sheeting to prevent erosion.
3. The extent of the excavation shall be based on the Architectural and Structural Drawings. The Contractor shall confirm the size of the excavation required by the basement and report any discrepancy with these Drawings to GeoPacific Consultants Ltd.
4. The Contractor must obtain prior permission in writing to carry out any work on adjacent private property.
5. The Contractor shall inform GeoPacific Consultants Ltd. of any surcharge loads which will be within half the height of the excavation from the top of the excavation so that the support system can be modified to support the additional loads. The Contractor shall also inform GeoPacific if and when any groundwater seepages occur which may require additional special drains as outlined in Note 3.4, Drawing G-2.
6. The ground conditions must be confirmed by GeoPacific Consultants Ltd. when the excavation is 4 feet deep. The Contractor is responsible for ensuring that GeoPacific personnel inspect the site.

DRAWING LIST:

Certified Professional Program
FEB 05 2019
John Buscemi

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
M. J. KOKAN
21364

ISSUED FOR CONSTRUCTION

FEB 0 1 2019

REFERENCE:

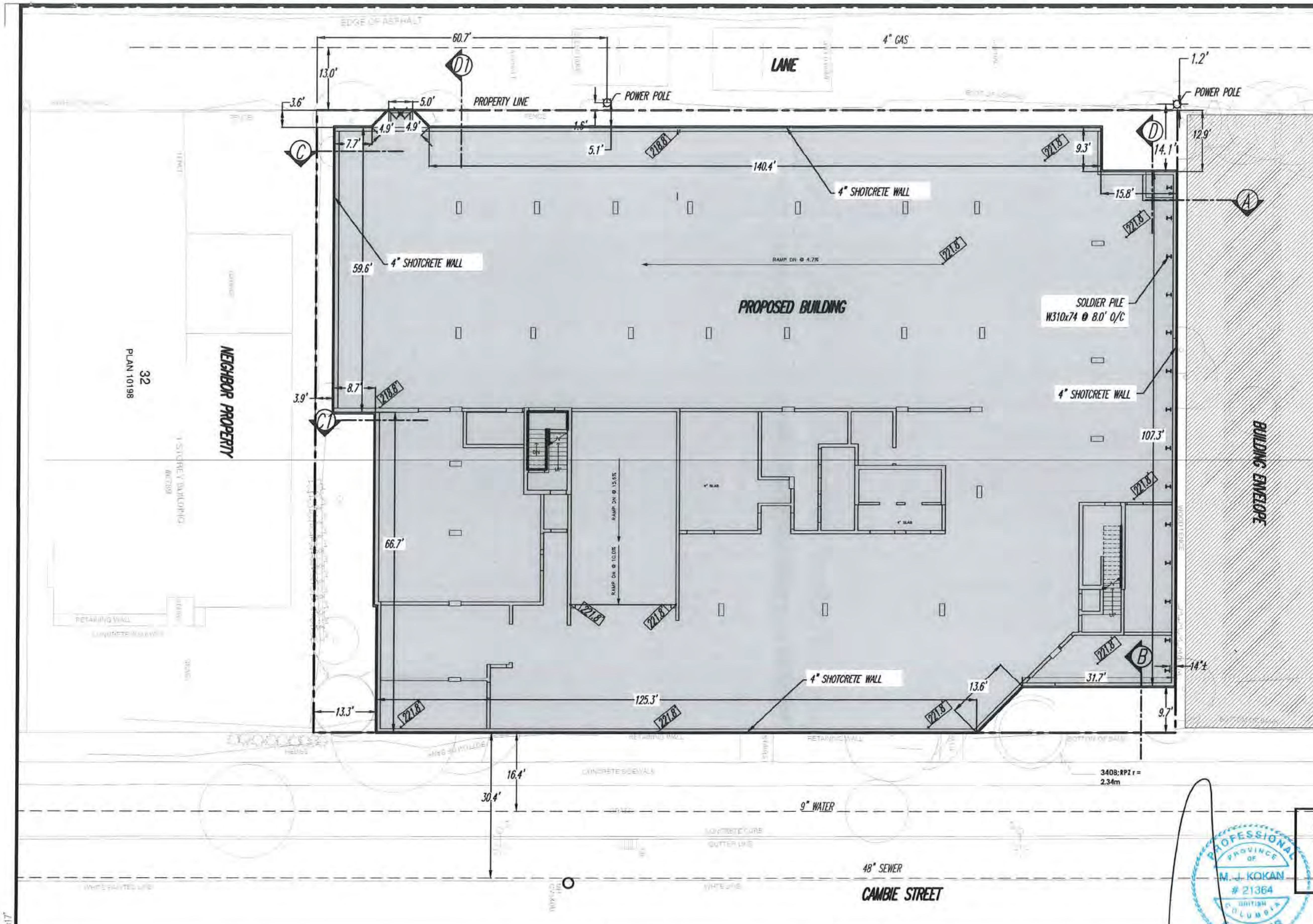
GEOPACIFIC
VANCOUVER KAMLOOPS CALGARY
1779 W. 75th Avenue
Vancouver, B.C. V6P 6P2
P 604.439.0922
F 604.439.9189

SCALE: -

PROPOSED RESIDENTIAL DEVELOPMENT
6318 CAMBIE STREET, VANCOUVER, B.C.
GENERAL NOTES

FILE NO.: 13626
DWG. NO.: G-2 (SHEET 2 OF 2)

REVISIONS:
A.
B.
C.



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SUSANA D. CHOI

MAY 2 3 2018

Date Stamp

SITE PLAN

SCALE 1"=20'

LEGEND:

EL 123.5' – GRADE ELEVATION

123.5' – PROPOSED SLAB ELEVATION

N.E.L. – NOMINAL EXCAVATION LEVEL AT PERIMETER = SLAB EL.–3.3' OR AS SHOWN

SUBMISSION FOR BUILDING PERMIT 2018-05-17

PROFESSIONAL ENGINEER – PROVINCE OF BRITISH COLUMBIA – M. J. KOKAN # 21364

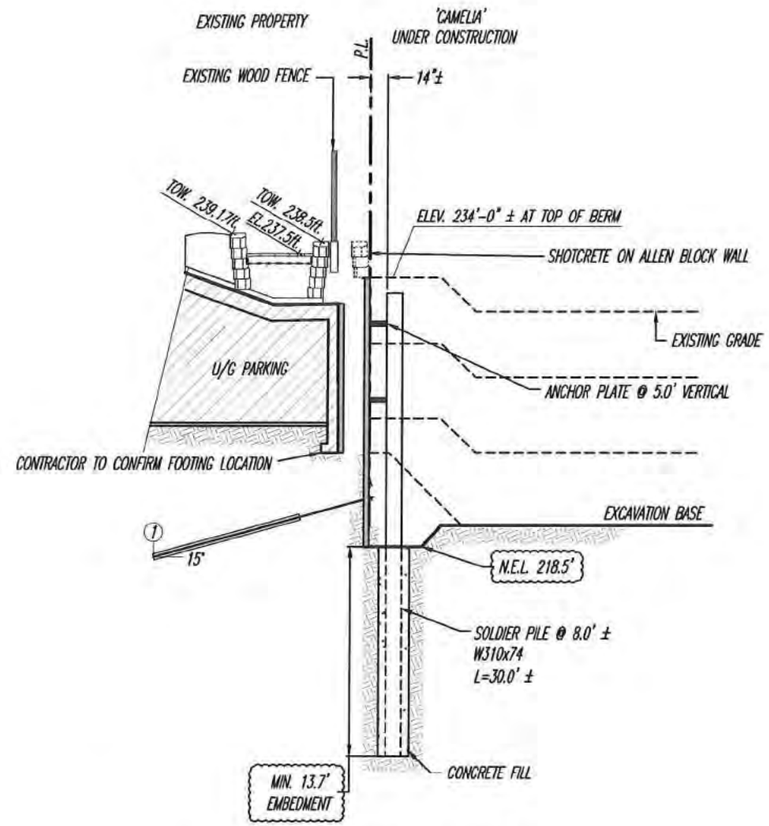
MAY 2 2 2018

REFERENCE:	GEOPACIFIC VANCOUVER KAMLOOPS CALGARY 1779 W. 75th Avenue Vancouver, B.C. V6P 6P2 P 604.439.0922 F 604.439.9189	DATE: SEPTEMBER 29, 2016 DRAWN BY: N.D. / APPROVED BY: M.J.K. / REVIEWED BY: K.F. SCALE: AS SHOWN	RESIDENTIAL DEVELOPMENT 6733 CAMBIE STREET, VANCOUVER, BC SHORING – SITE PLAN	FILE NO.: 13567 DWG. NO.: G–S1	REVISIONS: A. NOVEMBER 3, 2016 – ELEVATION CHANGE, SECTIONS C & D1 B. JANUARY 11, 2017 – BC HYDRO C. AUGUST 4, 2017 – ARCH. UPDATE D. DECEMBER 19, 2017 – NORTH SHORING WALL E. JAN 8, 2017 – N. SHORING WALL rev. cloud F. MAY 17, 2018 – N.E.L. 16" LOWER G.

ORIGINAL PAPER SIZE 11"x17"

Shoring Installation & Decommission Sequence:

1. *Install angles (L152 x 102 x 7.9) continuously at the base of existing Allen Block wall*
2. *Tack welding at each angle connection*
3. *Install suitable bolts on existing Allen Block wall by drilling method*
4. *Install 4" shotcrete on Allen Block wall*
5. *Install soldier piles by cased method with fully grouted within their embedment and sand or pea gravel above*
6. *Excavate skinny channel by hand and Install 2 x 4 studs immediately below the continuous angle*
7. *Install diagonal angles (L76 x 76 x 4.8) between the continuous angle (L152 x 102 x 7.9) and solider piles*
8. *Install max 2' high 4" shotcrete between 2 x 4 studs*
9. *Install max 5' high 4" shotcrete by 3-days sequence with continuous 2 - 15M bars behind anchor plate*
10. *Continue Step 9 to the base of the neighbouring foundation elevations*
11. *Saw cut existing anchors installed for the neighbouring shotcrete wall without any damage on the existing shotcrete wall and their drain mat.*
12. *Install underpinning anchors through berm*
13. *Install 4" shotcrete wall by 3-days sequences*
14. *Construct proposed foundation wall between the shotcrete wall and solider piles with windows at anchor plate locations*
15. *Construct proposed roof with windows at soldier beam locations*
16. *Remove solider piles and anchor plates*
17. *Reinstate all windows as per recommendations provided by others*



SECTION A (SHORING COMPLETION)
SCALE 1"=10'

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2018-05-17

MAY 2 2 2018

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA M. J. KOKAN # 21364

REFERENCE:	GEOPACIFIC VANCOUVER KAMLOOPS CALGARY 1779 W. 75th Avenue Vancouver, B.C. V6P 6P2 P 604.439.0922 F 604.439.9189	DATE: DECEMBER 19, 2017 DRAWN BY: J.S. / APPROVED BY: M.J.K. / REVIEWED BY: K.F. SCALE: AS SHOWN	RESIDENTIAL DEVELOPMENT 6733 CAMBIE STREET, VANCOUVER, BC SHORING - SECTION A	FILE NO.: 13567 DWG. NO.: G-S2A	REVISIONS: A. JAN 8, 2017 - N. SHORING WALL rev. cloud B. MAY 17, 2018 - N.E.L. 16" LOWER C.

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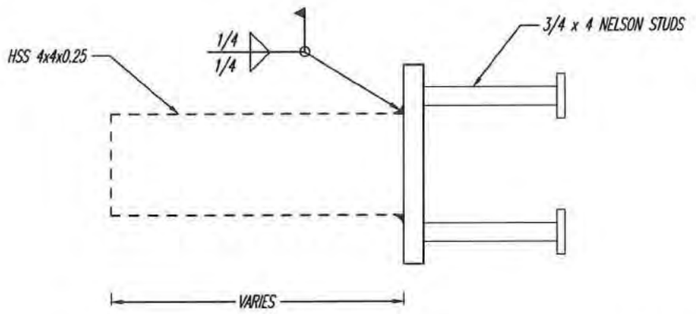
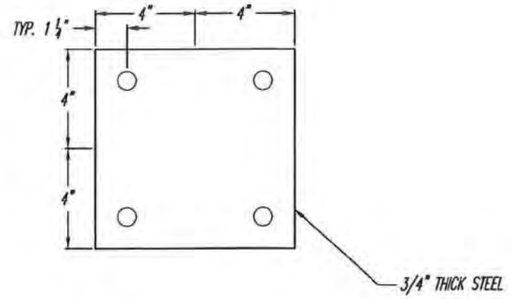
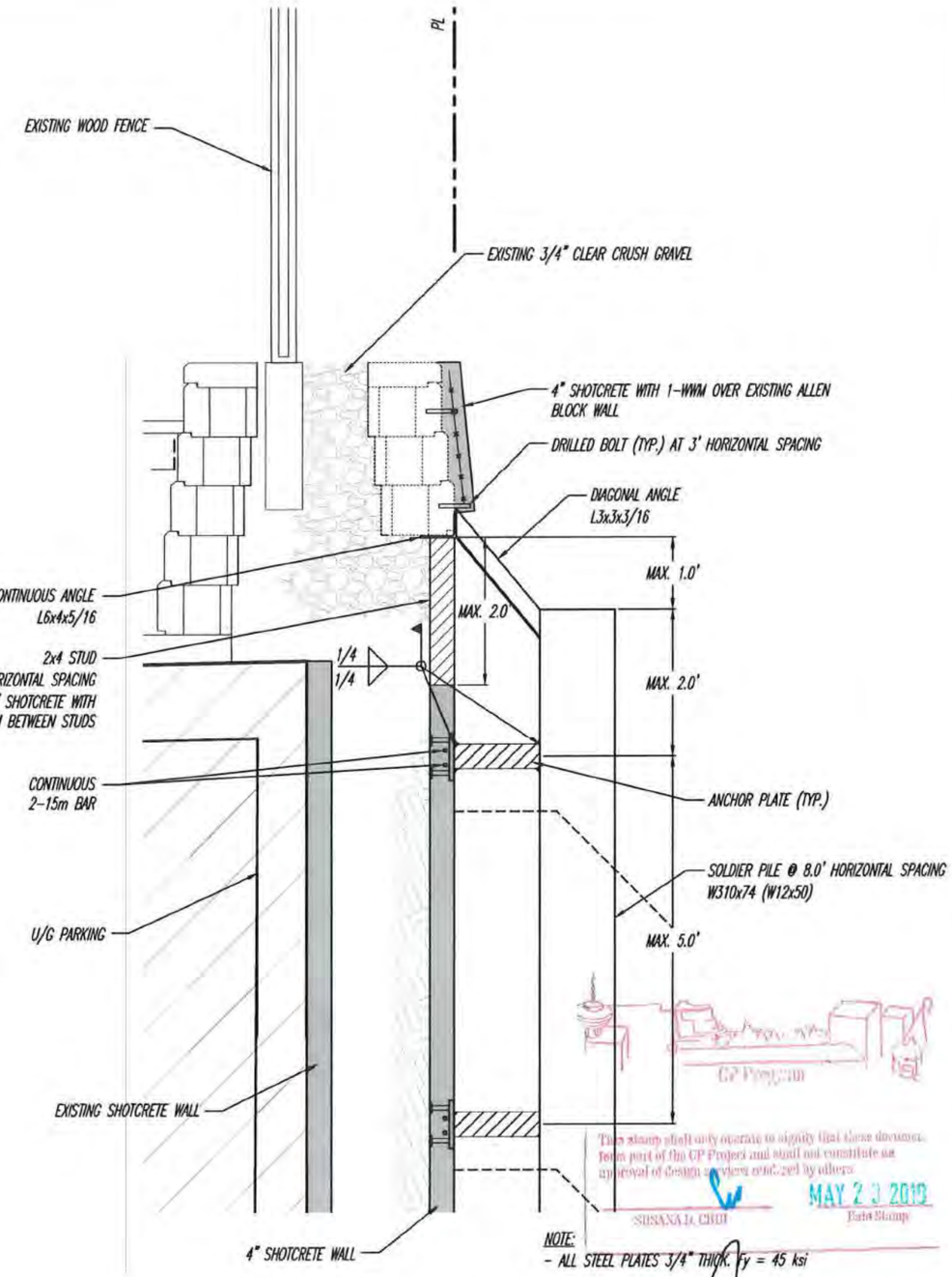
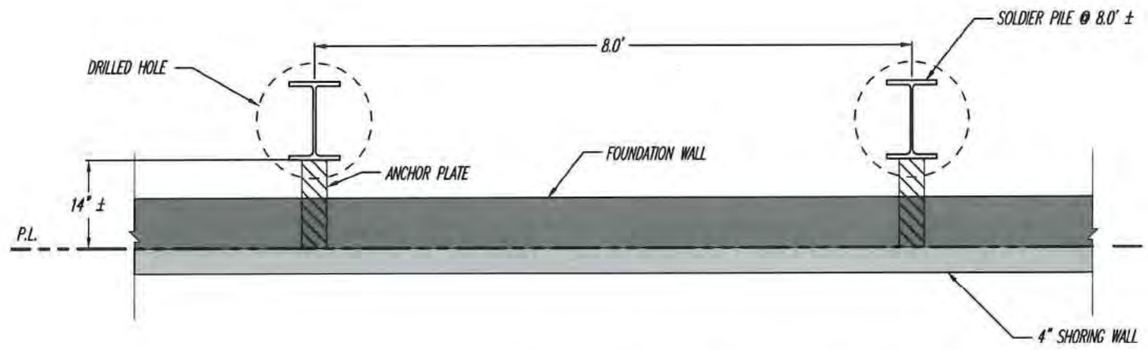




ANCHOR PLATE DETAIL
SCALE N.T.S.





BRACKET CONNECTION DETAIL - PLAN
SCALE N.T.S.

BRACKET CONNECTION DETAIL - SECTION
SCALE 1"=2'

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PROVINCE OF BRITISH COLUMBIA
M. J. KOKAN
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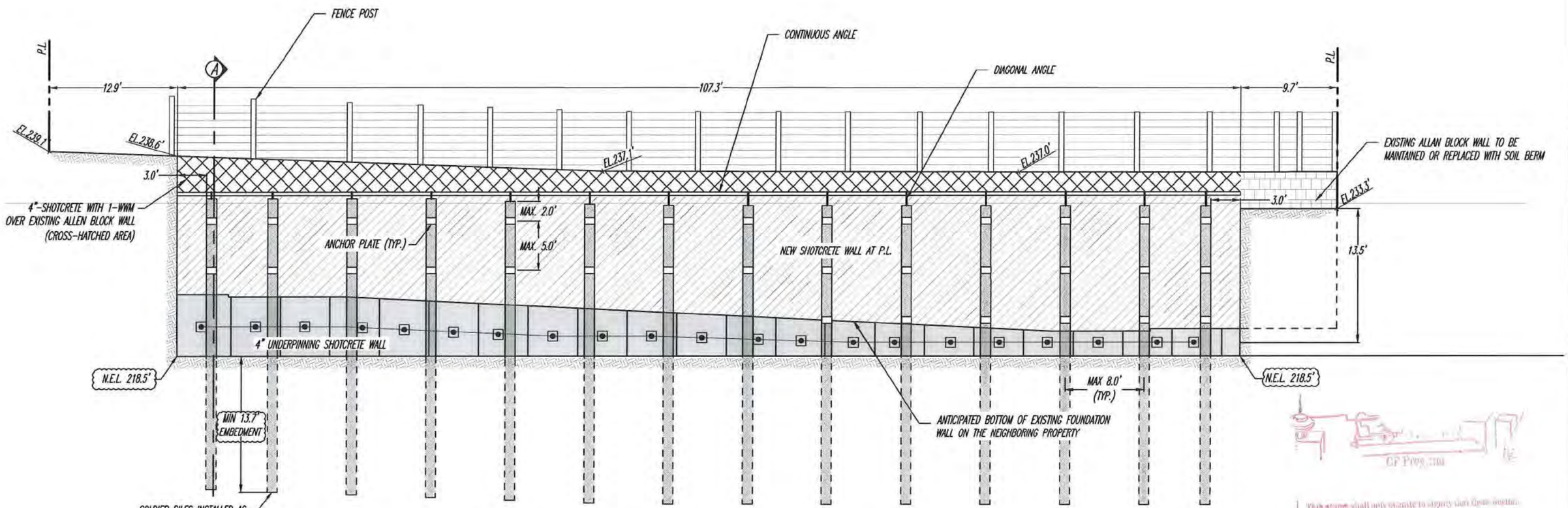

NORTH ELEVATION
SCALE 1"=10'

GP Proj. 13567

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SUSANA C. CHOI

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Date Stamp

SUBMISSION FOR BUILDING PERMIT
2018-05-17

MAY 2 2 2018

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
M. J. KOKAN
21364

ORIGINAL PAPER SIZE 11"x17"

REFERENCE:

GEOPACIFIC
VANCOUVER KAMLOOPS CALGARY

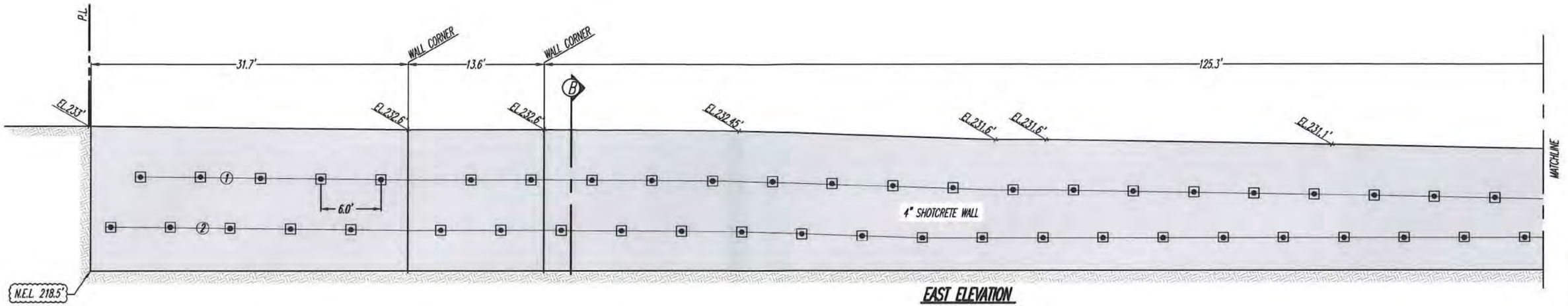
1779 W. 75th Avenue
Vancouver, B.C. V6P 6P2
P 604.439.0922
F 604.439.9189

DATE: DECEMBER 19, 2017		
DRAWN BY: J.S.	APPROVED BY: M.J.K.	REVIEWED BY: K.F.
SCALE: AS SHOWN		

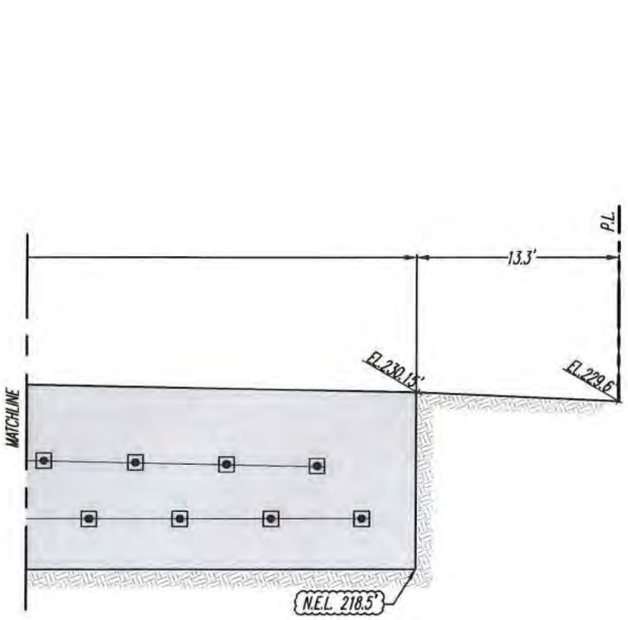
RESIDENTIAL DEVELOPMENT
6733 CAMBIE STREET, VANCOUVER, BC
SHORING – NORTH ELEVATION

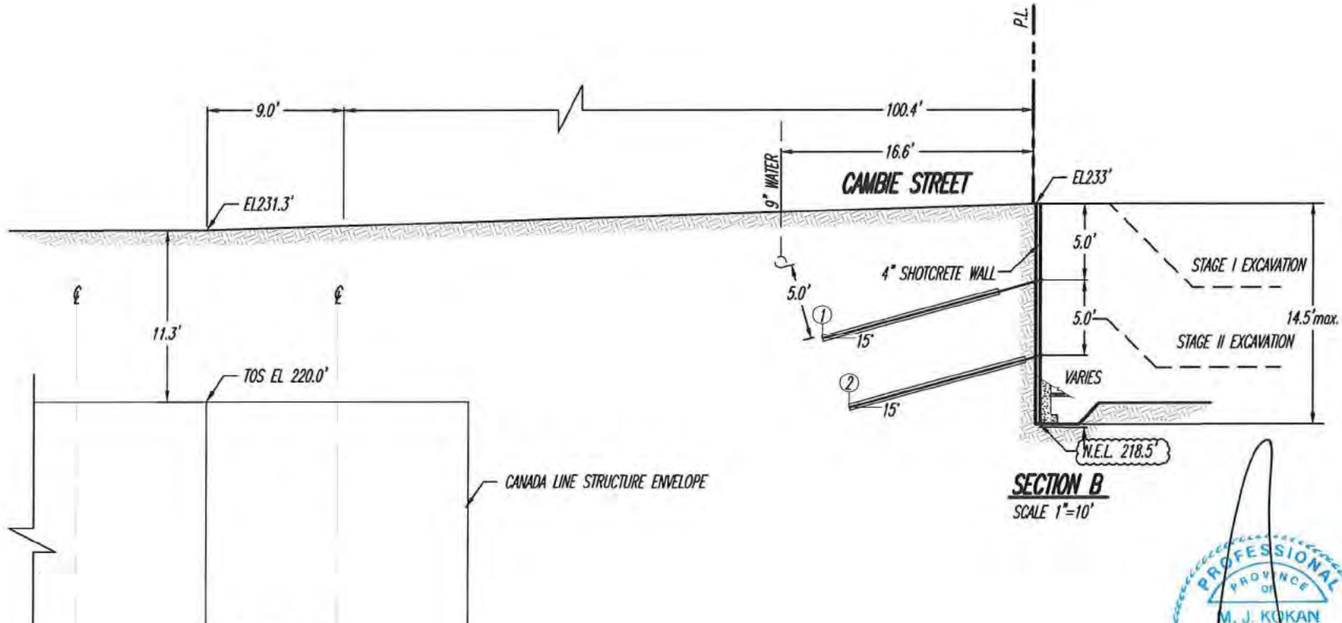
FILE NO.: 13567
DWG. NO.: G-S2C

REVISIONS:
A. JAN 8, 2017 – N. SHORING WALL rev. cloud
B. MAY 17, 2018 – N.E.L. 16" LOWER
C.



EAST ELEVATION
SCALE 1"=10'





SECTION B
SCALE 1"=10'

SECTION B
DYWIDAG ϕ6 Gr 75/100 OR APPROVED ALTERNATE

ROW	LENGTH (ft/m)	GROUTED (ft/m)	LOCKOFF (kips/kN)	SPACING (ft/m)
1	15/4.5	12/3.6	20/90	6/1.8
2	13/4.0	12/3.6	20/90	6/1.8

CONTRACTOR TO CONFIRM LOCATION OF ALL U/G UTILITIES AND STRUCTURES

GP Project

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PROVINCE OF BRITISH COLUMBIA
M. J. KOKAN
21364

SUBMISSION FOR BUILDING PERMIT
2018-05-17

MAY 2 2 2018

REFERENCE:

GEOPACIFIC
VANCOUVER KAMLOOPS CALGARY

1779 W. 75th Avenue
Vancouver, B.C. V6P 6P2
P 604.439.0922
F 604.439.9189

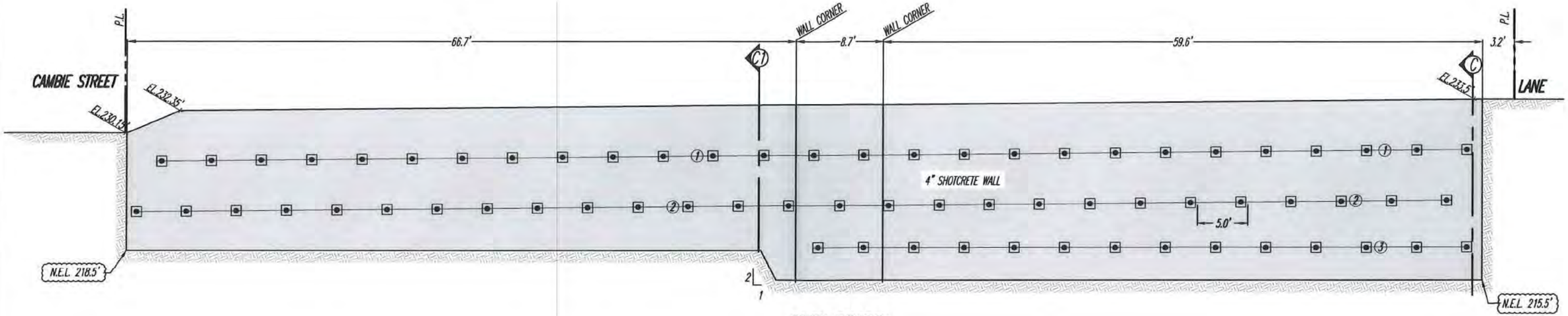
DATE:	SEPTEMBER 29, 2016	
DRAWN BY: N.D.	APPROVED BY: M.J.K.	REVIEWED BY: K.F.
SCALE:	AS SHOWN	

RESIDENTIAL DEVELOPMENT
6733 CAMBIE STREET, VANCOUVER, BC
SHORING – EAST ELEVATION & SECTION B

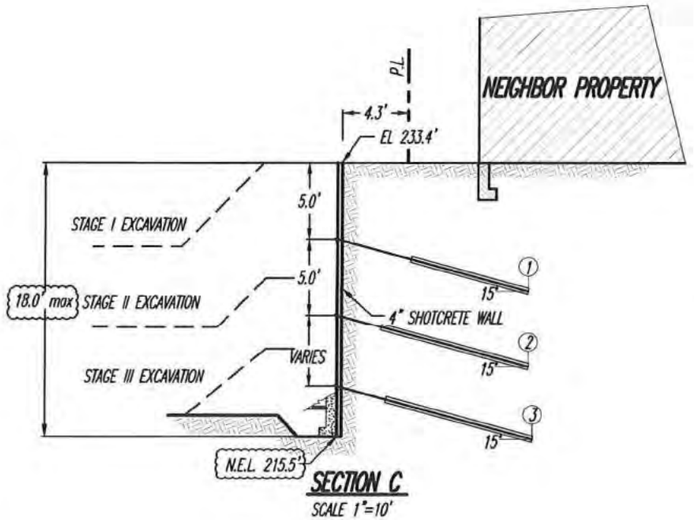
FILE NO.: 13567
DWG. NO.: G-S3

REVISIONS:
A. AUGUST 4, 2017 – ARCH. UPDATE
B. DECEMBER 19, 2017 – NORTH SHORING WALL
C. JAN 8, 2017 – N. SHORING WALL rev. cloud
D. MAY 17, 2018 – N.E.L. 16" LOWER
E.
F.

ORIGINAL PAPER SIZE 11"x17"



SOUTH ELEVATION
SCALE 1"=10'



SECTION C
SCALE 1"=10'

SECTION C
DYWIDAG #6 Gr 75/100 OR APPROVED ALTERNATE

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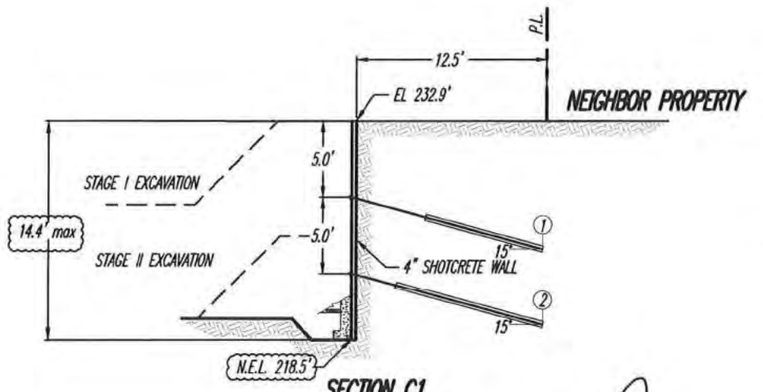
2	13/4.0	10/3.0	18/80	5/1.5
3	13/4.0	10/3.0	18/80	5/1.5

CONTRACTOR TO CONFIRM LOCATION
OF ALL U/G UTILITIES AND STRUCTURES



SECTION C1
SCALE 1"=10'

SECTION C1
DYWIDAG #6 Gr 75/100 OR APPROVED ALTERNATE

ROW	LENGTH (ft/m)	GROUTED (ft/m)	LOCKOFF (kips/kN)	SPACING (ft/m)
1	13/4.0	8/2.4	15/68	5/1.5
2	13/4.0	10/3.0	18/80	5/1.5

CONTRACTOR TO CONFIRM LOCATION
OF ALL U/G UTILITIES AND STRUCTURES

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SUSANA D. CHEE

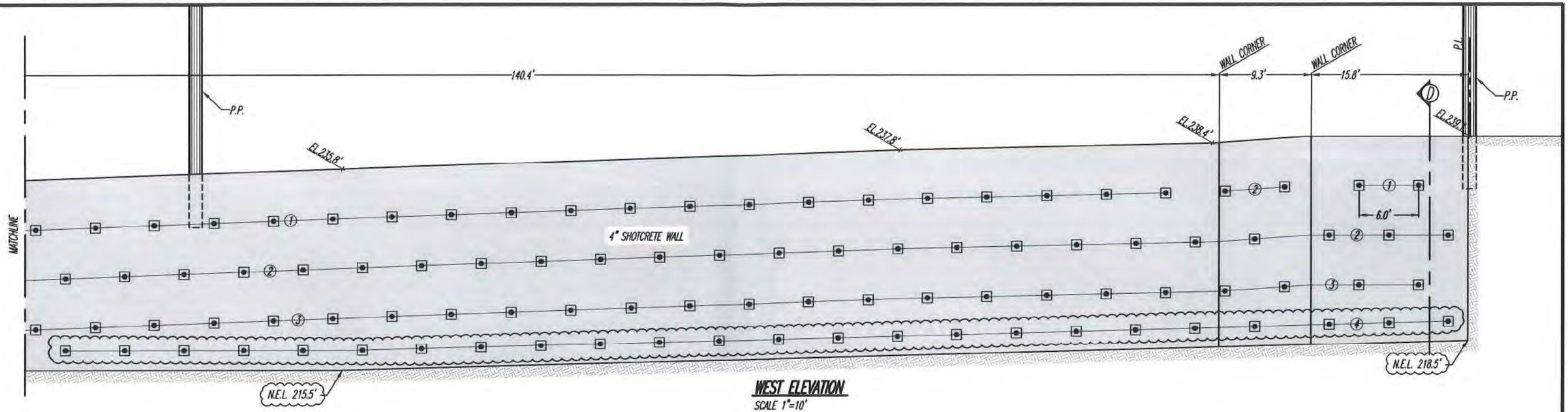
MAY 2 3 2018
Date Stamp

SUBMISSION FOR
BUILDING PERMIT
2018-05-17

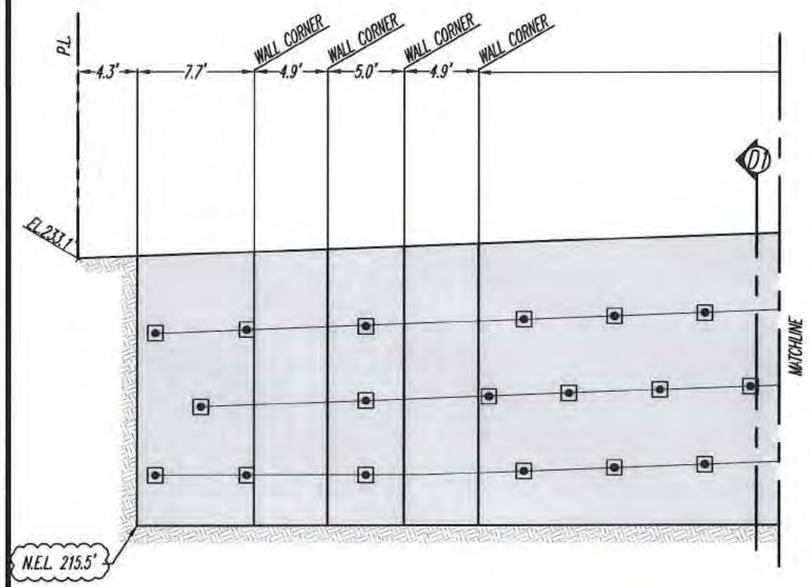
MAY 2 2 2018

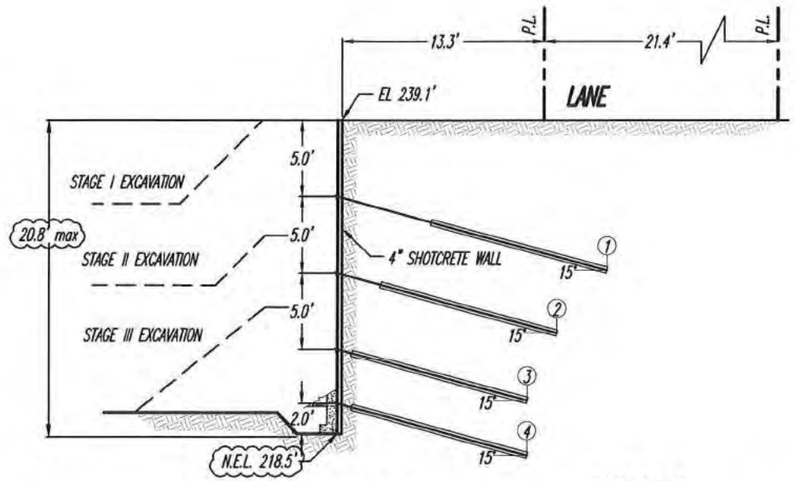
ORIGINAL PAPER SIZE 11"x17"

REFERENCE:	GEOPACIFIC VANCOUVER KAMLOOPS CALGARY 1779 W. 75th Avenue, Vancouver, B.C. V6P 6P2 P 604.439.0922 F 604.439.9189	DATE: SEPTEMBER 29, 2016 DRAWN BY: N.D. / APPROVED BY: M.J.K. / REVIEWED BY: K.F. SCALE: AS SHOWN	RESIDENTIAL DEVELOPMENT 6733 CAMBIE STREET, VANCOUVER, BC SHORING – SOUTH ELEVATION & SECTION C	FILE NO.: 13567 DWG. NO.: G-S4	REVISIONS: A. NOVEMBER 3, 2016 – ELEVATION CHANGE, SECTIONS C & D1 B. AUGUST 4, 2017 – ARCH. UPDATE C. DECEMBER 19, 2017 – NORTH SHORING WALL D. JAN 8, 2017 – N. SHORING WALL rev. cloud E. MAY 17, 2018 – N.E.L. 16" LOWER F. G.

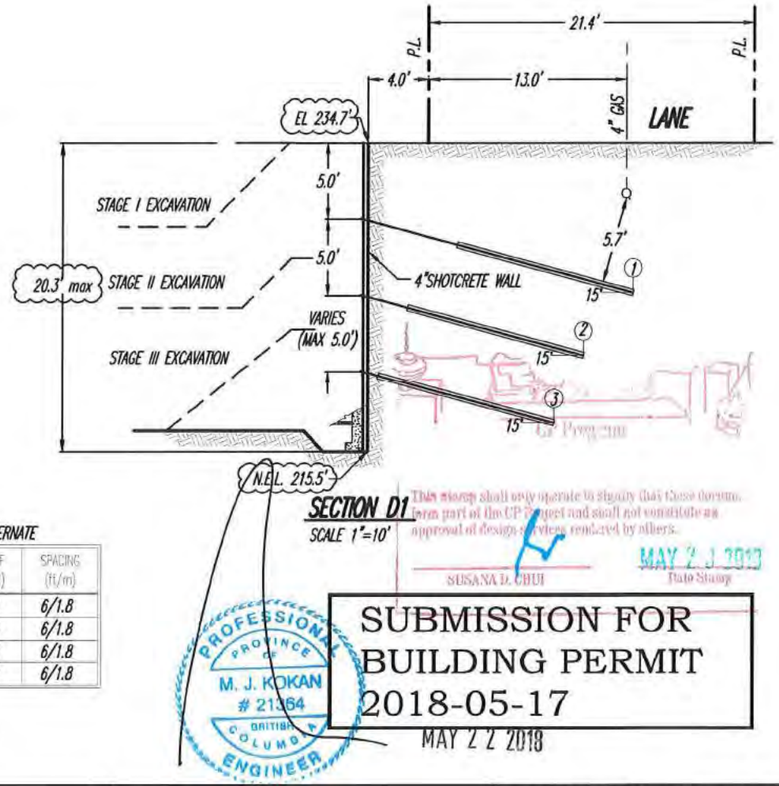


WEST ELEVATION
SCALE 1"=10'





SECTION D
SCALE 1"=10'



SECTION D1
SCALE 1"=10'

SECTION D & D1
DYWIDAG #6 Gr 75/100 OR APPROVED ALTERNATE

ROW	LENGTH (ft/m)	GROUTED (ft/m)	LOCKOFF (kips/kN)	SPACING (ft/m)
1	18/5.4	12/3.6	20/90	6/1.8
2	15/4.5	12/3.6	20/90	6/1.8
3	13/4.0	12/3.6	20/90	6/1.8
4	13/4.0	12/3.6	20/90	6/1.8

CONTRACTOR TO CONFIRM LOCATION
OF ALL U/G UTILITIES AND STRUCTURES

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SUSANA D. CHUI
MAY 2 J 2018
Date Stamp

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
M. J. KOKAN
21364

SUBMISSION FOR
BUILDING PERMIT
2018-05-17
MAY 2 2 2018

ORIGINAL PAPER SIZE 11"x17"

REFERENCE:

GEOPACIFIC
VANCOUVER KAMLOOPS CALGARY

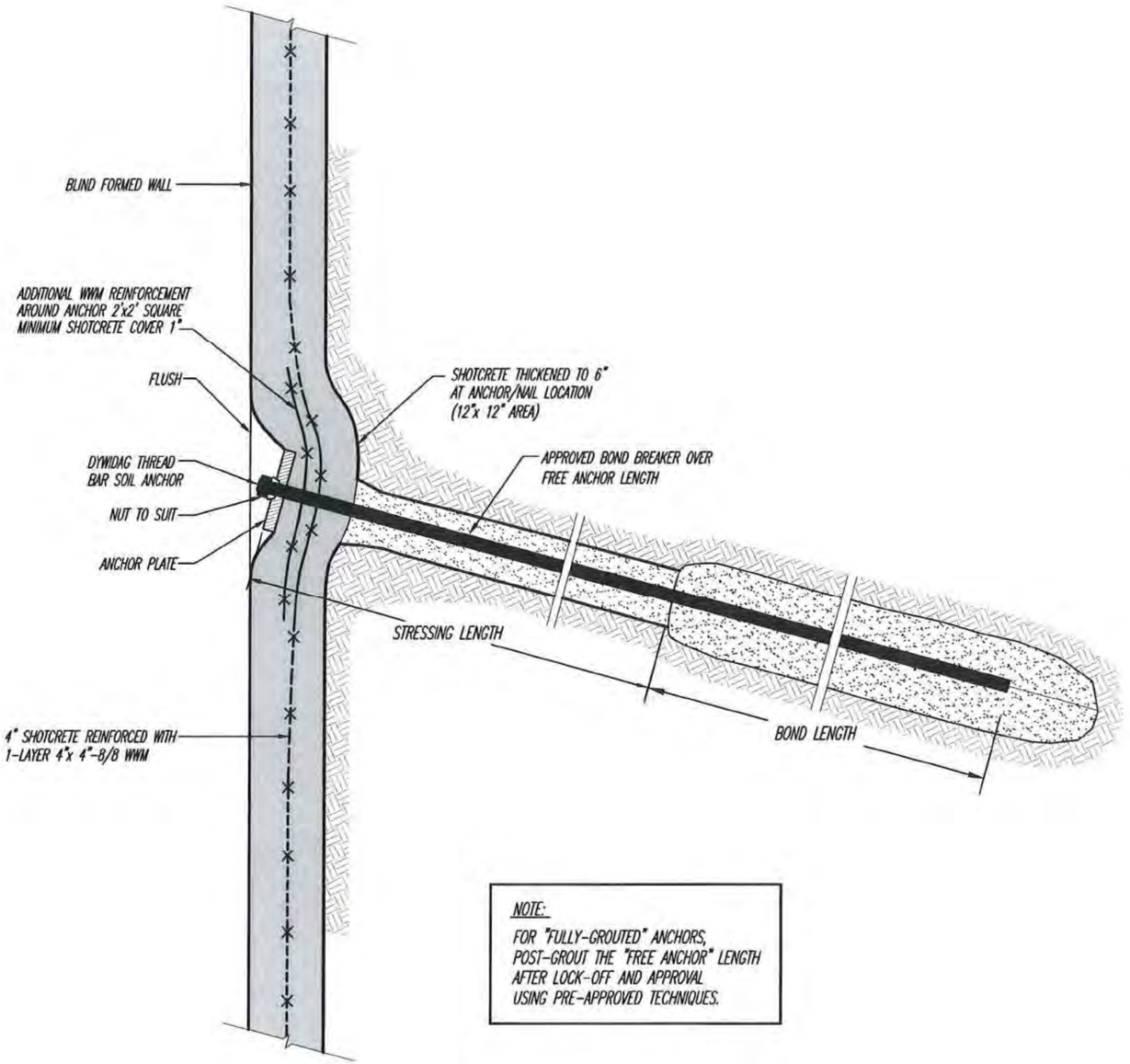
1779 W. 75th Avenue
Vancouver, B.C. V6P 6P2
P 604.439.0922
F 604.439.9189

DATE: SEPTEMBER 29, 2016
DRAWN BY: N.D. | APPROVED BY: M.J.K. | REVIEWED BY: K.F.
SCALE: AS SHOWN

RESIDENTIAL DEVELOPMENT
6733 CAMBIE STREET, VANCOUVER, BC
SHORING – WEST ELEVATION & SECTION D

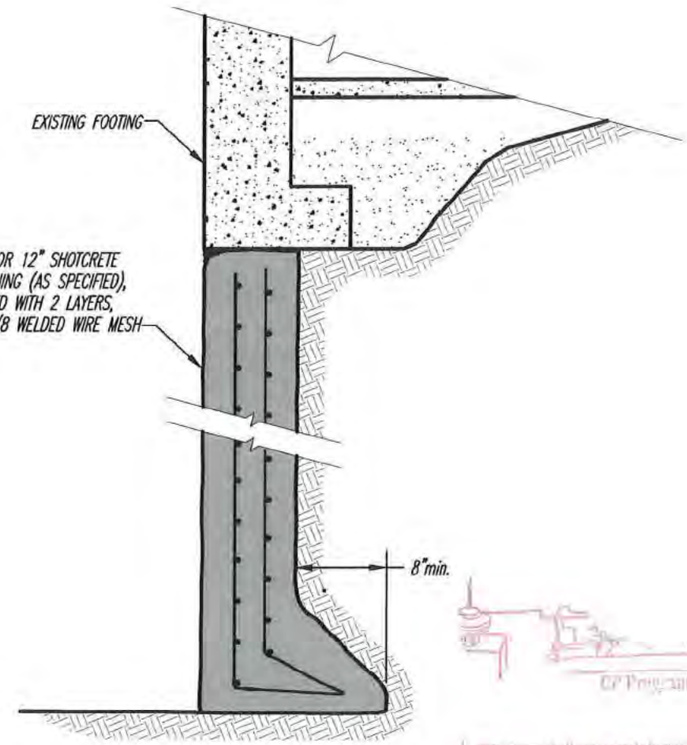
FILE NO.: 13567
DWG. NO.: G-S5

REVISIONS:
A. NOVEMBER 3, 2016 – ELEVATION CHANGE, SECTIONS C & D1
B. JANUARY 11, 2017 – BC HYDRO
C. AUGUST 4, 2017 – ARCH. UPDATE
D. DECEMBER 19, 2017 – NORTH SHORING WALL
E. JAN 8, 2017 – N. SHORING WALL rev. cloud
F. MAY 17, 2018 – N.E.L. 16" LOWER
G.



ANCHORED SHOTCRETE DETAIL
N.T.S.

NOTE:
FOR "FULLY-GROUTED" ANCHORS, POST-GROUT THE "FREE ANCHOR" LENGTH AFTER LOCK-OFF AND APPROVAL USING PRE-APPROVED TECHNIQUES.



UNDERPINNING DETAIL

CP Program

This stamp shall only operate to signify that these documents form part of the CP Project and shall not constitute an approval of design services rendered by others.

SUSANA B. CHIB — MAY 2 3 2019 Date Stamp

SUBMISSION FOR BUILDING PERMIT
2018-05-17

MAY 2 2 2018

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — M. J. KOKAN # 21364

ORIGINAL PAPER SIZE 11"x17"

REFERENCE:	GEOPACIFIC VANCOUVER KAMLOOPS CALGARY 1779 W. 75th Avenue, Vancouver, B.C. V6P 6P2 P 604.439.0922 F 604.439.9189	DATE: SEPTEMBER 29, 2016 DRAWN BY: N.D. / APPROVED BY: M.J.K. / REVIEWED BY: K.F. SCALE: AS SHOWN	RESIDENTIAL DEVELOPMENT 6733 CAMBIE STREET, VANCOUVER, BC ANCHORED SHOTCRETE & UNDERPINNING DETAILS	FILE NO.: 13567 DWG. NO.: G-1	REVISIONS: A. B. C.

1.0 GENERAL

1.1 In these Notes, the Engineer is GeoPacific Consultants Ltd.

1.2 These Notes must be read in conjunction with the design Drawings.

1.3 The work described and shown involves near vertical excavated slopes or structure using a combination of shotcrete and ground anchors. All slopes shall be covered with secured polyethylene sheeting to prevent erosion.

1.4 The anchors will be installed in ground around the site and the actual soil and groundwater conditions must be assumed.

1.5 The grouted anchor lengths required to resist the design loads are based on the assumed conditions. The capacity of the anchors will be confirmed at the beginning of the contract and may be lengthened or shortened.

1.6 Some utilities, foundations and structures which may affect the installation procedures and techniques are noted on the Drawings.The Contractor shall confirm the locations and condition of ALL man-made elements which may be damaged because of the anchored shotcrete operations. It is the Contractor's responsibility to install the anchored shotcrete in the actual site conditions encountered.

Elements which may, in the opinion of the Contractor, be damaged by the anchored shotcrete operations must be reported to the Engineer well in advance of the work to take place.

1.7 These documents are based on architectural, structural and survey Drawings provided. It is the Contractor's responsibility to verify all dimensions and report discrepancies to the Engineer.

1.8 The Contractor shall schedule and co-ordinate the work to satisfy the reasonable requirements of adjacent Owners and Tenants who shall be given sufficient Notice before carrying out work which may affect their property.

1.9 The Contractor shall erect and maintain a secure closed hoarding around the site for the safety of all persons in the vicinity of the site.

1.10 The Contractor shall inspect the slopes and the support to the slopes and structures daily and shall immediately report any potentially damaging movement or deterioration to the Engineer by telephoning 604-439-0922.

2.0 MATERIALS

2.1 ANCHOR BAR:

The anchors shall be installed in minimum 75 mm (3 inch) diameter holes which shall be drilled, unless otherwise approved in advance by the Engineer. Anchor capacity is dependant upon installation techniques and the drilling equipment and methods shall be subject to the Engineer's approval.

Drilling techniques shall produce a hole which is free of debris and ensure continuous support of the hole and shall not erode or disturb soil around the hole.

2.2 Anchor tendons shall be as shown on the design drawings.

Anchorage equipment couplings and any necessary wedges washers and plates shall be in accordance with the tendon manufacturer's specifications and requirements.

Minimum anchorage length ("fixed" length) and stressing length ("free" length) are shown on the Drawings.

2.3 Grout in the anchorage shall be a prior-approved non-shrink cementitious material mixed with a minimum compressive strength of 5 MPa in 24 hours and 35 MPa in 28 days.

2.4 Shotcrete shall be reinforced with 102 x 102 MW13.3/13.3 (4"x4"-8/8) welded wire mesh as shown on the Drawings. Steel shall have a minimum yield strength of 450 MPa (65 ksi) and shall be in accordance with ASTM A497.

2.5 All shotcreting shall be carried out in accordance with ACI 506 : "Specifications for Materials Proportioning and Application of Shotcrete"

2.6 Shotcrete shall have a minimum compressive strength of 5 MPa in 24 hours and 30 MPa in 28 days. The Engineer may require test panels to be prepared by the Contractor so they can be cored by others to confirm the shotcrete strength. The Contractor shall co-operate with the independent testing laboratory appointed by the Owner for this purpose.

3.0 INSTALLATION

3.1 Hollow Core Bar Installation (if required)

Set the bar on an appropriate drill rig. Start pumping the grout to assure that grout will exit drill bit.

Proceed with rotary drilling and flushing approx. three feet per min (depending on ground condition). Rotation speed should be approx. 60 to 120 RPM. To achieve higher friction values, advance and retract the bars several times for each 3.0 m (10 feet) length of bar installed in the bond zone.

The grout should be applied CONTINUOUSLY during drilling. A grout pump with at least 60 l/min volume and minimum 2 MPa (300 psi) pressure capacity (preferably 10 MPa, 1500 psi) should be used.

Refer to the manufacture's specifications and recommendations for more detail.

3.2 Anchors and shotcrete shall be installed in sequence and stages to maintain stability of the excavation. Excavation of soil from the site shall also take place in stages. Stages shall not exceed 1.8 m (6 feet) vertical.

The Contractor may remove all soil within any mass excavation Stage before anchors in that Stage are installed but further excavation shall not take place until all anchored shotcrete in that Stage is installed and approved by the Engineer.

The mass excavation for any Stage does not include a perimeter berm with a minimum top width of one metre and a side slope of 1 horizontal to 1 vertical.

Ground conditions may locally require a wider berm, flatter slopes and/or other slope protection measures including covering or short-term temporary support.

The perimeter berms in any stage shall be excavated in staggered panels. THE MAXIMUM WIDTH OF A PANEL SHALL BE THE HORIZONTAL SPACING OF THE ANCHOR PLUS 0.6 M (2 FEET). This panel width may be INCREASED OR DECREASED by the Engineer's agreement, in writing, BEFORE increasing the panel width.

No adjacent panels shall be excavated concurrently and no more than 1/3 of the panels shall be excavated concurrently. In addition no panel shall be excavated into the berm until at least 24 hours after that panel anchor has been grouted.

Anchors and shotcrete may be installed concurrently in different panels. Anchors shall be installed at right angles to the property lines on plan and within 2.5 degrees of the declination shown on the Drawings except with the prior approval of the Engineer.

SUBMISSION FOR
BUILDING PERMIT
2018-05-17

MAY 2 2 2018

PROFESSIONAL
PROVINCE OF
M. J. KOKAN
21364
BRITISH COLUMBIA
ENGINEER

REFERENCE:	GEOPACIFIC VANCOUVER KAMLOOPS CALGARY 1779 W. 75th Avenue Vancouver, B.C. V6P 6P2 P 604.439.0922 F 604.439.9189	DATE: SEPTEMBER 29, 2016 DRAWN BY: N.D. APPROVED BY: M.J.K. REVIEWED BY: K.F. SCALE: AS SHOWN	RESIDENTIAL DEVELOPMENT 6733 CAMBIE STREET, VANCOUVER, BC GENERAL NOTES	FILE NO.: 13567 DWG. NO.: G-2 (SHEET 1 OF 2)	REVISIONS: A. B. C.	

ORIGINAL PAPER SIZE 11"x17"

3.3 Immediately following excavation of the soil berm in a panel the excavated face shall be trimmed back to the required line and mesh reinforcement shall be fixed to the soil to ensure the minimum specified shotcrete cover. Shotcrete shall be applied without delay to thicknesses shown on the Drawings.

Shotcrete panels shall be kept moist to aid curing by spraying with water and covering with sacking or polyethylene sheeting.

Sufficient wire mesh reinforcement shall be installed to provide a full strength overlap with adjacent panels. This overlap shall not be less than 200 mm (8 inch).

The end surfaces of panels shall be thoroughly cleaned with compressed air to ensure a full strength bond when adjacent panels are shotcreted.

3.4 Drains to relieve groundwater pressure shall be installed through the shotcrete. Drains shall be a minimum of 50 mm (2 inches) diameter and at normal 3.0 m (10 feet) centres horizontally and 1.5 m (5 feet) centres vertically. The Contractor shall install filters in drains as fines are being removed with the water.

Additional special drains may be required where water seeps are noted. This special drains shall consist of minimum 50 mm (2 inches) diameter perforated ABS pipe installed within 75 mm (3 inches) diameters holes drilled 5 degrees UPWARDS from the 3 metres (10 feet) measured from the face of the shotcrete. These special drains may be required to be filtered with fine sand or gravel or filter fabrics.

3.5 Anchors shall be tensioned as soon as practicable but no sooner than 24 hours after the construction of the applicable shotcrete panel. Anchors shall be tensioned and tested as follows:

3.5.1 Apply a proof load of 1.33 times the lock-off load for two minutes. Monitor the load in the anchor. If the reduction in load is less than 2.5 percent of proof load reduce the load to lock-off load and lock the working load into the anchor.

3.5.2 If the anchor does not hold at least 133 percent of lock-off load for two minutes the Engineer must be informed. Further testing in the presence of the Engineer will required as follows:

Load the anchor in 22 kN (5 kip) increments to 130.5 percent of lock-off load. Hold each increment for 5 minutes except at maximum load when the load shall be maintained for 100 minutes. The increase in length of the anchor shall be measure at the start and end of each load increment except at maximum load when the extension shall be measured at 5 minutes intervals.

This information shall be utilized by the Engineer to deduce the utilized anchor length and to assess the creep characteristics.

Anchors which creep more than 2 mm (0.08 inch) per log cycle of time will not be accepted. The Contractor shall install replacement anchors at the Contractor's expense.

4.0 SHOTCRETE REMOVAL/ANCHOR DETENSIONING

4.1 All excavation and support works within the CITY OF VANCOUVER shall be in strict accordance with the City's requirements.

4.2 No part of the anchor system shall remain in place within 1.5 m (5 feet) of final grade. Anchors 1.5 m (5 feet) below final grade shall be detensioned or fully grouted when no longer required in the opinion of the Engineer.

4.3 No shotcrete shall remain in place within 1.5 m (5 feet) of final grade. A bond breaker must be installed between blind-formed foundation walls and shotcrete on city property to allow for shotcrete removal.

5.0 BACKFILLING ON AND ADJACENT TO CITY PROPERTY

5.1 Backfilling on and adjacent to City property must be in accordance with the City's backfill specifications, with the City's backfill specifications, "Street Restoration Manual" dated AUGUST 18, 2008.

5.2 Backfill Containment dams will be required at excavation corners where excavation to be backfilled against City property.

6.0 REQUIRED INSPECTIONS

6.1 The following are the MINIMUM inspections which are required by the Geotechnical Engineer. The Contractor is responsible for informing the Geotechnical Engineer that the Work is ready for these inspections. The Contractor shall be liable for any loss caused by failure to inform the Geotechnical Engineer that the Work is ready for inspection.

1. 2 days before work commences on site.
2. 1 day before the anchors are detensioned.
3. 2 days before backfilling commences.
4. 1 day before shotcrete removal.

6.2 Daily Inspection is required during installation of anchors, and full time inspection is required during anchor testing.

7.0 CONTRACTOR QUALIFICATION

7.1 Temporary works and shoring installation is highly sensitive to processes including sequence of installation, quality and quantity of materials used, monitoring of the works and other factors. Consequently a high degree of skill and professionalism is required for its successful implementation. As a result, all contractors considered for tender of the shoring work described in the Design Drawings must be approved by the Engineer in advance of tender. The work must be carried out only by a shoring contractor with experience and expertise in shoring construction. The contractors experience and expertise must be with projects of similar size and scope to that shown in the Design Drawings. The following shoring contractors are permitted to undertake the work:

- Malcon Canada
- Southwest Contracting
- Bel Pacific Excavation & Shoring
- Vancouver Shotcrete
- Blue Ace Shoring
- Power Shotcrete Shoring LTD.
- Mainland Excavation & Shoring ltd.

7.2 The preceding list does not express or imply any guarantee or warranty of the contractor's performance. It is the responsibility of the contractor to undertake the work shown on the Design Drawings.

7.3 Shoring contractors other than those listed above may be considered by the Engineer only with submission of references and qualifications for at least 10 projects of similar size and scope. GeoPacific reserves the right to accept or reject the qualifications of any shoring contractor.

NOTES:

1. The excavation support design is based on the locations of adjacent structures and utilities which have been supplied. The Contractor shall confirm the locations and elevations of all foundations and utilities which may be affected by the work and raport any discrepancies to GeoPacific Consultants Ltd. (Tel.: 439-0922)
2. All slopes shall be covered with secured polyethylene sheeting to prevent erosion.
3. The extent of the excavation shall be based on the Architectural and Structural Drawings. The Contractor shall confirm the size of the excavation required by the basement and report any discrepancy with these Drawings to GeoPacific Consultants Ltd.
4. The Contractor must obtain prior permission in writing to carry out any work on adjacent private property.
5. The Contractor shall inform GeoPacific Consultants Ltd. of any surcharge loads which will be within half the height of the excavation from the top of the excavation so that the support system can be modified to support the additional loads. The Contractor shall also inform GeoPacific if and when any groundwater seepages occur which may require additional special drains as outlined in Note 3.4, Drawing G-2.
6. The ground conditions must be confirmed by GeoPacific Consultants Ltd. when the excavation is 4 feet deep. The Contractor is responsible for ensuring that GeoPacific personnel inspect the site.

DRAWING LIST:

ORIGINAL PAPER SIZE 11"X17"

REFERENCE:

GEOPACIFIC VANCOUVER KAMLOOPS CALGARY
1779 W. 75th Avenue Vancouver, B.C. V6P 6P2
P 604.439.0922 F 604.439.9189

DATE:	SEPTEMBER 29, 2016	
DRAWN BY: N.D.	APPROVED BY: M.J.K.	REVIEWED BY: K.F.
SCALE:	AS SHOWN	

RESIDENTIAL DEVELOPMENT
6733 CAMBIE STREET, VANCOUVER, BC
GENERAL NOTES

FILE NO.: 13567
DWG. NO.: G-2 (SHEET 2 OF 2)

REVISIONS:
A.
B.
C.

GEOPACIFIC
VANCOUVER KAMLOOPS CALGARY

P 604.439.0922
F 604.439.9189
geopacific.ca
1779 W 75th Ave.
Vancouver, B.C. Canada V6P 6P2

L & A Real Estate Investments Ltd
550-601 West Broardway
Vancouver, B.C.
V5Z 4C2

February 16, 2016
File: 13626

Attention: Harry Wong

Re: Geotechnical Investigation Report: Mid-Rise Primarily Residential Building
6318-6340 Cambie Street, Vancouver, B.C.

1.0 INTRODUCTION

We understand that a new mid-rise primarily residential building has been proposed at 6340 Cambie Street in Vancouver. Preliminary design drawings prepared by Integra Architects show up to eight levels of midrise, and town houses with two levels of above grade development over two or possibly three levels of below grade parking. We understand that the intent is to use reinforced concrete construction both above and below grade.

This report was prepared exclusively for L & A Real Estate Investments for their use and for the use of others on their development team. This report provides recommendations for the design and construction of the proposed development based on the soil and groundwater conditions encountered at the site.

2.0 SITE DESCRIPTION

The proposed development site is located on the east side of Cambie Street, in Vancouver, B.C. The site is bounded by side by side duplexes to the north, and south, Cambie Street to the west and a paved lane to the east.

The site is nearly square in shape, measuring up to approximately 48 m by 40 m and is relatively flat sloping slightly to the south east. The site is presently improved with two side by side duplexes, with at grade parking at the rear.

3.0 FIELD INVESTIGATION

The subsurface ground conditions at the site were investigated on February 15th, 2016. A total of three auger test holes were excavated to depths between 9.2 to 15 meters below existing site grades. Two Dynamic Cone Penetration Tests (DCPT) were undertaken to determine the relative in-situ density of the soils. This drilling was completed using a track-mounted drill rig, supplied and operated by Uniwide Drilling Ltd. of Burnaby, BC.

The investigation was supervised and the soils encountered were logged in the field by a technician from our office. The test holes were backfilled with excavated soil upon completion of logging and sealed with bentonite chips, in accordance with Provincial abandonment requirements. The results of our auger test holes and DCPT's are presented in Appendix A of this report.

The approximate locations of the auger test holes and DCPT's with respect to the development site are shown on our Drawing No. 13626-01, following the text of this report.

4.0 SUBSURFACE CONDITIONS

4.1 Soil Conditions

The general geology of the region under investigation is described as Capilano sediments, according to Geological Survey of Canada map 1486A. It is characterized on the Geological Survey of Canada map as raised marine, deltaic and fluvial deposits with medium to coarse sand 1 to 4 m thick.

ASPHALT/TOPSOIL: The surficial sand fill (beneath grass or asphalt) contains varying amounts of silt and gravel, and may also contain variable organic material, which extends to depths between 1.0 and 1.5 metres below current site grades.

Medium Sand **GLACIAL TILL**: Glacial till was encountered at all locations at depths starting between 1.0 and 1.5 below grade. The dense to very dense grey till generally consists of homogenous, dominantly medium sand to fine sand with some silt and minor uniformly distributed gravel. Moderately hard drilling was generally encountered with occasional zones of softer drilling. Brownish oxidation was prevalent at the top of this sequence however is absent below approximately 3.0 meters. Samples were dominantly damp becoming wet with depth.

Coarse Sand **GLACIOFLUVIAL DEPOSITS**: Fluvial sands were encountered at depths approximately six meters below grade. These moderately dense to dense brown to grey coarse sands are intermittently bedded, and moderately well sorted within bedding. Some thicker, typically denser layers of fine sand with minor silt were observed within the coarse sand sequence. Soft drilling with occasional harder zones was typically encountered, with harder drilling encountered at the base of all holes. Samples were typically wet to saturated and commonly washed from the drill stem.

Medium Sand **GLACIAL TILL**: Medium to fine sand glacial till was again encountered at variable depth below coarse sands within all three holes however as a result heavy water inflow within the coarse sand samples typically had poor return.

For a more detailed description of the sub-surface soil conditions please refer to the individual test holes logs located in Appendix A of this report.

4.2 Groundwater Conditions

A persistent zone of elevated ground water flow was located below dense fine sands, and was encountered in all three test holes. Heavy to moderate elevated water flow was encountered below approximately six meters. Heavy water inflow was observed during drilling and sample return was largely washed from the auger stem in all three holes.

The coarser sand layers within the inter-bedded sands and gravels are very pervious and large groundwater flows have been experienced on similar sites. Hence there is potential for elevated water pressures to occur with depth. Based on the contemplated depth of excavation and observed water level, this basal founding stratum is expected to generate moderate to heavy seepage if exposed in an open excavation without any flow mitigation measures.

The level of groundwater is also expected to vary seasonally with highest levels reached during the wet months of spring and winter. A shallow perched water table was also encountered variably above approximately 1.0 meters, emanating at the base of fill material, and beneath pavements.

Seepage can be expected to be light to moderate at shallow depth across the site, with some moderately heavy flows should be expected initially when the upper perched water table is penetrated.

5.0 DISCUSSION

The proposed development will consist of an eight storey and two storey structures over up to three levels of below grade parking. We expect loading induced by the new development to be relatively heavy with loading of up to 7,000 kN on columns and 150 kN per lineal meter on walls.

The below grade parking is to be constructed directly against or near to the property lines on all sides of the excavation, thus we expect that shoring will be undertaken to support a vertical cut line. In our experience, conventional anchored shotcrete can be used for these ground conditions. Micropiles may be required to achieve lower row 1 anchors to avoid services within the adjoining roadways. Retaining walls at property lines will require underpinning or removal, with the soils behind shored.

We anticipate that the lowest founding elevation will be supported on a moderately dense glaciofluvial sands with minor gravel which were encountered at depths of approximately 7 to 10 meters below current grades. We expect that the new structures will be constructed on conventional pad and strip foundations.

We expect that normal pumped sumps would be sufficient to control initial perched groundwater flows during excavation and a conventional drained cavity could be constructed around the below grade parkade. Additional well point dewatering may be required during excavation at lower levels if high water flows are encountered.

The subsurface soils are not expected to be prone to liquefaction or other forms of ground softening under the design earthquake defined under the 2007 Vancouver Building By-Law.

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

6.0 DESIGN RECOMMENDATIONS

6.1 Site Preparation

Prior to construction of foundations and floor slabs, all unsuitable materials including vegetation, topsoil, fill, organic material, debris, refuse, and loose or otherwise disturbed soils, including fill material must be removed from the construction areas to expose a subgrade of very dense glacial till, or moderately dense glaciofluvial sands with minor gravel.

Any softened, disturbed subgrade should be removed under the review of GeoPacific, and replaced with lean mix (5.0 MPa) concrete beneath the foundations. Crushed gravel as described in Section 6.4 or engineered fill can be placed beneath the slab-on-grade only.

In the context of this report, engineered fill beneath building foundations is defined as clean sand or sand and gravel fill, compacted in 300 mm loose lifts to a minimum of 98% of its Standard Proctor maximum dry density (ASTM D698), at a moisture content that is within 2% of optimum for compaction.

6.2 Building Foundations

We expect the buildings to be founded on a moderately dense glaciofluvial sands with minor gravel or

engineered fill. Therefore, the proposed building can be founded on normal spread foundations, including pad and strip footings.

For a subgrade of very dense glacial till, prepared as described above, foundations may be designed on the basis of a serviceability limit state (SLS) bearing pressure of 400 kPa and ultimate limit state (ULS) bearing pressure of 600 kPa. For a subgrade of engineered fill, as described in Section 6.1, foundations may be designed on the basis of a SLS bearing pressure of 100 kPa and ULS bearing pressure of 150 kPa

For foundations designed as recommended we expect that settlements should be limited to less than 25 mm total and 20 mm over 10 m differential.

Irrespective of specified bearing pressures, footings should not be less than 450 mm in width for strip footings and not less than 600 mm in width for square or rectangular footings.

Foundation sub-grades must be inspected by the geotechnical engineer prior to construction of foundations.

6.3 Seismic Design of Foundations

The site is considered to be generally underlain by dense soils which can be considered as Site Class C, in accordance with Table 4.1.8.4.A. of the 2014 Vancouver Building By-Law. The subsurface soils beyond the depth of foundations are not considered prone to ground liquefaction or other forms of ground softening caused by earthquake induced ground motions.

A design seismic hazard having a 2% probability of exceedance in a 50-year period (return period of 1 in 2,475 years) would result in a peak ground acceleration (PGA) of 0.118g for this site (Site Coordinates: **49.2275** °N **123.1157**°W).

6.4 Slab-On-Grade Floors

In order to provide suitable support for the slab-on-grade floors we recommend that any fill placed under the slab should be engineered fill (see Section 6.1). Floor slabs should be underlain by a minimum of 150 mm thick layer of 19 mm clear crushed gravel. This free-draining layer should have hydraulic connection to the perimeter drain system. A moisture barrier should underlie the slab directly above the free draining granular material.

6.5 Groundwater Control

A perimeter drainage system will be required for the below grade structure to prevent the development of water pressure on the foundation walls and the basement floor slabs. Groundwater flows are expected to be moderate, likely in the range of 50 to 100 litres/minute for the entire excavation. These flow rates should be confirmed at the time of construction.

Moderate to high ground water inflows should be expected in moderately dense glaciofluvial sands below five meters. Staged excavation with a conventional pumped de-watering system is expected to be adequate to maintain the water inflows however localized well points may also be required at lower levels of the excavation and or around the core and sump excavations at the base of the foundation.

6.6 Excavation and Shoring

As noted above, shoring may be required in order to construct the two to three levels of underground parking that will extend directly to the property lines. We anticipate that excavation depths will be up to about 7.0 to 10.0 m below existing grades. Some ground movements should be expected during installation of the

shoring. Based on the soil conditions identified in our test holes and our experience with similar sites, we expect movements of up to 12 mm should be expected at face of excavation, decreasing to 6 mm at 3 m back of the excavation face.

It is our opinion that the natural soils are sufficiently strong that vertical cuts may be supported with the use of shotcrete shoring with ground soil anchors, which is the most economical system available in Greater Vancouver. Hollow core (self-drilling) anchors should be anticipated in the sandy zones below dense glacial till. In addition, face saving measures should be anticipated in the entire excavation where sand layers were encountered in our investigation.

Our observations during our site investigation as well as our experience in this area indicate that cobbles and boulders may be present within the native soils. Cobbles and small boulders can typically be removed with conventional excavation equipment. However, large boulders may require splitting/blasting to facilitate their removal from the site.

6.7 Lateral Pressure on Foundation Walls

Earth pressures against the foundation walls are dependent on factors such as, available lateral restraint along the wall, surcharge loads, backfill materials, compaction of the backfill and drainage conditions.

The foundation wall is expected to be partially yielding and fully restrained between the parking floors and backfilled with a free draining granular soil. The full development of the active condition is expected within the retained soil and can be assumed under these conditions.

We recommend that the foundation walls be designed to resist the following lateral earth pressures, assuming fully shored perimeter walls and single sided form construction with synthetic flat drain between the shoring wall and the final basement wall:

Static: Triangular soil pressure distribution of 3.5 H (kPa), where H is equal to the total wall height in meters.

Seismic: Inverted triangular soil pressure distribution of 2.0 H (kPa), where H is equal to the total wall height in meters.

The preceding loading recommendations assume that the backfill is level behind the wall, and the wall is frictionless. All loadings noted above are unfactored. The free groundwater will be lowered during the excavation and will be maintained lower by the drainage system to be installed so our earth pressures recommended above does not account for any hydraulic pressure.

Any additional surcharge loads located near the foundation walls should be added to the earth pressures given.

7.0 FIELD REVIEWS

The preceding sections make recommendations for the design and construction of the proposed building at 6311 Cambie Street in Vancouver, B.C. We have recommended the review of certain aspects of the design and construction. It is important that these reviews are carried out to ensure that our intentions have been adequately communicated. It is also important that any contractors working on the site review this document prior to commencing their work.

It is the contractors' responsibility to advise GeoPacific Consultants Ltd. (a minimum of 48 hours in

advance) that a field review is required. Geotechnical field reviews are normally required at the time of the following:

1. Stripping	Review of stripping depth.
2. Excavation	Review of temporary slopes and soil conditions.
3. Shoring	Review of shoring installation and tests.
4. Engineered Fill	Review of materials and compaction degree.
5. Foundation	Review of foundation subgrade.
6. Slab-on Grade	Review of under slab fill materials and compaction.
7. Backfill	Review of placement of backfill along foundation walls.

8.0 CLOSURE

This report has been prepared exclusively for L & A Real Estate Investments Ltd for the purpose of providing geotechnical recommendations for the design and construction of the proposed building, temporary excavations and related earthworks. The report remains the property of GeoPacific Consultants Ltd. and unauthorized use of, or duplication of, this report is prohibited.

We are pleased to be of assistance to you on this project and we trust that our comments and recommendations are both helpful and sufficient for your current purposes. If you would like further details or would like clarification of any of the above, please do not hesitate to call.

For:

GeoPacific Consultants Ltd.

Reviewed by:

JUL 0 7 2017

Luke van der Meer, B.Sc., P.Geo
Project Geologist

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

LEGEND:

TH16-# -TEST HOLE (TH) LOCATION

HOLE LOCATIONS ARE APPROXIMATE

SITE PLAN

SCALE: 1:800

REFERENCE:

GEOPACIFIC
VANCOUVER ... CALGARY

DATE: FEBRUARY 16, 2016			
DRAWN BY: M.P.	APPROVED BY: M.J.K.	REVIEWED BY: L.V.	
SCALE: AS SHOWN			

MIXED USE DEVELOPMENT

6318, 6328, 6338, & 6340 CAMBIE STREET, VANCOUVER, B.C.

TEST HOLE LOCATION PLAN

FILE NO.: 13626

DWG. NO.: 13626-01

REVISIONS:
A.
B.

Test Hole Log: TH16-01

File: 13626
Project: Residential Development
Client: Landa Realestate
Site Location: 6318-6340 Cambie St, Vancouver, Bc

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

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 / 0		Ground Surface	0.0				
1		**TopSoil**	0.5				
2 / 1		**Sand (FILL)** Dominantly clean medium SAND, with minor organics throughtout. Moderatley dense - Damp	1.1			▼	Water level from surface seepage
3 / 2		**Sand (Till)** Clean medium to fine grained SAND+ minor gravel. Moderatley dense to soft, heavy seepage from upper sands. Wet.	2.7			▼	Heavy seepage / inflow from sand layer
4 / 3		**Sand (Till/Fluvial)** Medium to coarse grained SAND (grey) with minor gravel. Soft to Moderatley dense. Wet from heavy seepage from above. Sample dominantley washed from auger stem, heavy seepage.					
5 / 4							
6 / 5							
7 / 6			7.6				Heavy Seepage throughout sand layer
8 / 7		**Sand (Till)** Soils becoming fine to medium grained sand - sample dominantley washed from Auger stem.	9.1				
9 / 8		End of Borehole					
10 / 9							
11 / 10							
12 / 11							
13 / 12							
14 / 13							
15 / 14							

Logged: LV
Method: Solid Stem Auger
Date: 15/02/2016

Datum:
Figure Number: A.01
Page: 1 of 1

Test Hole Log: TH16-02

File: 13626
Project: Residential Development
Client: Landa Realestate
Site Location: 6318-6340 Cambie St, Vancouver, Bc

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

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 / 0		Ground Surface	0.0		2		
		Pavement			14		
		Sand (FILL) Dominantly clean medium SAND. Moderatley dense - Damp	1.5		14		
1					15		
		Sand (Till) Medium SAND (grey) with minor gravel. Moderatley dense / stiff. Damp	2.3		50		Water level from surface seepage
2					>50		DCPT refusal @ 7ft
			3.0		>50		
3		**Sand (Till)** Medium SAND (grey-brown) with minor gravel, weak patchy oxidation. Moderatley dense / stiff. Damp to moist					Heavy seepage / inflow from sand layer
4							
5		**Sand (Till)** Medium SAND (grey) with minor gravel. Moderatley dense / stiff. Damp to moist-becoming wet. Seepag	5.8				Potential Aquifer zone below
6		**Sand (Fluvial)** Coarse to very coarse SAND (grey - brown) well rounded - well sorted clean sand with minor gravel and rear boulders. Possible fluvial channel deposit with high water flow within coarse sands. Moderately dense with abundent softer zones. Wet - high water flow out of the hole.					
7							
8			8.5				
			9.1				
9		**Sand (Till/Fluvial)** Medium SAND (grey) with minor gravel and silt. Dense to very dense. Wet					
10		**Sand (Fluvial)** Coarse to very coarse SAND (grey) well rounded - well sorted clean sand with minor gravel and rear boulders. Possible fluvial channel deposit with high water flow within coarse sands. Moderately dense with abundent softer zones. Wet - high water flow out of the hole.					Heavy water flow throughout sand layer (Sample washed from Rods)
11							
12			11.7				
13		**Sand (Till)** Medium to fine SAND (grey) becoming coarser grained, with occasional silt and gravel. Dense to very dense. Moist to wet.					
14							
15			15.2				
		End of Borehole					

Logged: LV
Method: Solid Stem Auger
Date: 15/02/2016

Datum:
Figure Number: A.02
Page: 1 of 1

Test Hole Log: TH16-03

File: 13626
Project: Residential Development
Client: Landa Realestate
Site Location: 6318-6340 Cambie St, Vancouver, Bc

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

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 / 0		Ground Surface	0.0		3		
		Pavement			9		
1 /		**Sand (FILL)** Dominantly clean medium SAND(grey brown) with minor silt. Dense / Stiff - Damp	1.1		9		
			1.5		18		
2 /		**Sand (Till)** Medium SAND (grey - brown) with minor silt and gravel, oxidized throughout. Moderatley dense / stiff. Damp			33		Water level from surface seepage
3 /		**Sand (Till)**			>50		DCPT refusal @ 7ft
					>50		
4 /							
5 /							
6 /			6.1				Potential Aquifer zone below
		Sand (Fluvial) Coarse to very coarse SAND (grey - brown) well rounded - well sorted clean sand with minor gravel and rear boulders. Possible fluvial channel deposit with high water flow within coarse sands. Moderately dense with abundent softer zones. Wet - high water flow out of the hole.	7.6				Sample dominatley washed away
7 /							
8 /							
9 /			9.1				
		Sand (Fluvial) Coarse to very coarse SAND- as above - sample dominantley washed away.					
10 /							
		Sand (Fluvial) Coarse to very coarse SAND- as above - sample dominantley washed away.	10.7				Heavy water flow throughout sand layer (Sample washed from individual Rods)
11 /							
		Sand (Fluvial) Coarse to very coarse SAND- as above - sample dominantley washed away.	12.2				
12 /							
		Sand (Fluvial) Coarse to very coarse SAND- as above - sample dominantley washed away.	13.7				
13 /							
14 /		**Sand (Till)** Medium to fine SAND- sample dominantley washed away.					
15 /			15.2				
		End of Borehole					

Logged: LV
Method: Solid Stem Auger
Date: 15/02/2016

Datum:
Figure Number: A.03
Page: 1 of 1

GEOPACIFIC CONSULTANTS

Vancouver Lab
#200 - 8809 Heather Street
Vancouver, BC
V6P 3T1

MOISTURE CONTENT REPORT
(ASTM D2216)

CLIENT:	L & A REAL ESTATE INVESTMENT LTD C/O HARRY WONG
PROJECT:	MIXED USE DEVELOPMENT
LOCATION:	6318,6328,6338 AND 6340 CAMBIE STREET, VANCOUVER

JOB #:	13626
RECEIVED:	16-Feb-16
TESTED:	16-Feb-16

HOLE #:	TH16 - 01	TH16 - 01	TH16 - 01	TH16 - 02	TH16 - 02
DEPTH:	7-8'	12-14'	16-17'	2-4'	5-7'
M/C:	19.9%	11.2%	13.8%	21.4%	13.1%

HOLE #:	TH16 - 02	TH16 - 02	TH16 - 02	TH16 - 02	TH16 - 02
DEPTH:	8-10'	15-20'	21-24'	30-35'	45-50'
M/C:	8.8%	10.6%	21.4%	22.3%	10.9%

HOLE #:	TH16 - 03	TH16 - 03			
DEPTH:	4-5'	12-14'			
M/C:	19.6%	12.0%			

HOLE #:					
DEPTH:					
M/C:					

HOLE #:					
DEPTH:					
M/C:					

HOLE #:					
DEPTH:					
M/C:					

COMMENTS:

DISTRIBUTION:

Per: Matt Akenhead, B.Sc., GIT

Lab Technician

Reviewed By: Dion Lauriente, B.A.Sc., EIT

Lab Manager

GEOPACIFIC
VANCOUVER KAMLOOPS CALGARY

P (604) 439 0922
F (604) 439 9189
www.geopacific.ca
#215-1200 West 73rd Ave.
Vancouver, B.C. Canada V6P 6G5

Minglian Holdings Ltd.
#203 - 1338 West Broadway
Vancouver, B.C.
V6H 1H2

September 29, 2016
File: 13567

Attention: Helen Xu

Re: Geotechnical Investigation Report: Proposed Residential Development
6733 Cambie Street, Vancouver, B.C.

1.0 INTRODUCTION

We understand that Minglian Holdings Ltd. has applied to construct a residential development at the above referenced properties in Vancouver, BC. The current proposed design is a six storey residential development with one level of underground parking. We anticipate a combination of reinforced concrete for below grade construction and wood frame construction above. We anticipate moderately heavy column and wall loads.

This report presents the results of our geotechnical investigation and makes recommendations for the design and construction of the proposed building and related earthworks. This report has been prepared exclusively for Minglian Holdings Ltd., for their use, the use of others on their design team and for the City of Vancouver for use in the development and permitting process.

2.0 SITE DESCRIPTION

The site includes three lots on Cambie Street south of W 50th Avenue, with a two-storey residential building on each lot. The site measures approximately 55 metres north south (along Cambie St.) and approximately 40 metres east west. The existing buildings are situated centrally on each lot, some with detached garages at the west side. The site is bound by Cambie St to the east, W 50th Ave to the north, a paved lane to the west, and a single-family residential lot to the south. The site slopes gradually from north to south, with an elevation difference of less than 2 metres.

The site location relative to the surrounding developments, as well as the existing improvements, are shown on our Drawing No. 13567-01, following the text of this report.

3.0 FIELD INVESTIGATION

GeoPacific completed two auger test holes and two Dynamic Cone Penetration Test (DCPT) soundings at the site on January 4th, 2016. The site was investigated using a truck-mounted drill rig supplied and operated by Uniwide Drilling Co. Ltd. of Burnaby, B.C. The locations of our test holes were limited by the location of the existing buildings, paved areas, and nearby underground utilities. The test holes were terminated at a depth of 6.1 metres. The DCPT reached a depth of 1.8 metres for both test holes. The test holes were logged by an engineer from our office and backfilled immediately following the completion of testing and logging. The detailed test hole logs are shown on Figures A.01 through A.02 in Appendix A of this report.

The approximate locations of the test holes and DCPT tests with respect to the site boundaries are shown on our Drawing No. 13567-01 following the text of this report.

4.0 SUBSURFACE CONDITIONS

4.1 Soil Conditions

The subsurface soil conditions generally consist of asphalt, grass, or concrete topsoil over silt and sand over dense till, comprised of silt to sand with occasional cobbles and boulders.

The general geology of the region under investigation is described as Capilano sediments, according to Geological Survey of Canada map 1486A. It is characterized on the Geological Survey of Canada map as raised marine, deltaic and fluvial deposits with medium to coarse sand 1 to 4 m thick, overlying Vashon Drift, locally know to be a dense lodgment till.

Please refer to the test hole logs located in Appendix A for specific subsurface soil descriptions. Laboratory test results are located in Appendix B.

A general description of the subsurface materials encountered in our field investigation is given below.

SAND with organic SILT (topsoil)

At both test holes, fill consisting of silty SAND and crushed gravel were found up to depths of 0.8 metres. It should be expected that grass areas should have deposits consisting of silty SAND, with some organic constituents extended to depths up to 0.5 metres below current site grades. The deposits contained some gravel, are dark brown in colour, and moist. The upper stratum is expected to vary with location given previous development, site grading, and buildings.

Sandy SILT to silty SAND

Sandy Silt to Silty SAND deposits were found containing traces of gravel, extending to depths of up to 1.8 m below current site grades. The colour ranges from light greyish blue to dark brown. The deposits were noted to be moist, with some perched groundwater observed at 3 metres below current site grades. This is the interface between the Silty SAND to SILT and SAND deposits and the GLACIAL TILL that underlies them.

Silty SAND (Glacial Till)

The GLACIAL TILL deposits were found to consist of silty SAND, with some gravel and cobbles. The deposits were observed to be grey in colour and dry. Random cobbles and boulders should be expected within glacial deposits. The glacial till was found to be dense to very dense. The GLACIAL TILL is expected to extend beyond the depth of new development.

SAND

The sand deposits were found to consist of a medium to coarse SAND. The sand was observed to be yellow and brown in colour and was saturated.

4.2 Groundwater Conditions

The static groundwater table was not encountered during our investigation. The anticipated development grade of the site is approximately 4.5 metres. Some perched groundwater was encountered in TH16-01 and TH16-02 on top of the relatively impermeable GLACIAL TILL at a depth of about 2.7 metres. Seepage may be present within any sand seams within the GLACIAL TILL.

5.0 DISCUSSION

5.1 General

We expect that the building will contain one level of below grade parking, extending to a depth of up to 4.5 metres below grade. We further expect the proposed building will be constructed to, or near to, the property lines on all sides. Therefore, we expect that shoring will required on all sides of the development, as well as underpinning for neighbouring buildings.

The site soils are not considered to be prone to ground liquefaction or other types of ground softening during the 2014 Vancouver Building By-Law design earthquake. Thus, ground improvement to control liquefaction is not required.

Our review of the ground conditions indicates that the proposed structure may be supported on conventional strip and pad foundations.

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

6.0 RECOMMENDATIONS

6.1 Site Preparation

Prior to construction of new foundations and floor slabs, all asphalt, vegetation, topsoil, fill, organic material, debris, refuse, and loose or otherwise disturbed soils must be removed from the construction areas to expose a subgrade of dense till-like silty sand and gravel.

The GLACIAL TILL is easily disturbed when wet. Therefore, we recommend the site be graded to direct water away from the foundations and that the exposed subgrade be blinded with 75 mm of 19 mm clear crush gravel.

Any soft, loose, or disturbed material must be removed in order to allow for construction on the proposed subgrade in its undisturbed natural state.

Site stripping must be reviewed by the geotechnical engineer prior to the placement of clear crush gravel.

6.2 Spread Foundations

Based on our investigation, we expect the buildings to be founded on undisturbed dense GLACIAL TILL. Therefore, the proposed building can be founded on normal spread foundations, including pad and strip footings.

For a subgrade of dense GLACIAL TILL, foundations may be designed on the basis of a serviceability

limit states (SLS) bearing pressure of 400 kPa and a factored ultimate limit state (ULS) bearing pressure of 800 kPa. For the bearing pressures provided, any grade reinstatement beneath the foundations must be done using clear crushed gravel.

Foundations and slabs can also be placed on engineered fill. In the context of this report, *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 100% of the Standard Proctor (ASTM D698) maximum dry density with a moisture content within 2% of optimum for compaction. The materials which may be derived from any excavation at this site will have significant silt content and are therefore not suitable to be used as engineered fill.

Footings constructed on well compacted engineered fill should be designed using a serviceability limit state (SLS) bearing pressure of 120 kPa and an ultimate limit states (ULS) bearing pressure of 240 kPa.

For foundations designed as recommended we expect that settlements should be limited to less than 25 mm total and 20 mm over 10 metres differential.

Irrespective of specified bearing pressures, footings should not be less than 450 mm in width for strip footings and not less than 600 mm in width for square or rectangular footings. Footings should also be buried a minimum of 450 mm below the surface for frost protection.

Foundation subgrades of all buildings must be reviewed by the geotechnical engineer prior to clear crush gravel blinding and footing construction.

6.3 Slab-On-Grade Floors

In order to provide suitable support for slab-on-grade floors we recommend that any fill placed under the slab should be granular and essentially "clean" with not more than 5% passing the #200 sieve. In addition, this granular fill must be compacted to a minimum of 98% Standard Proctor (ASTM D698) maximum dry density with moisture content within 2% of optimum for compaction.

Floor slabs should be directly underlain by a minimum of 150 mm of a free draining granular material. We recommend that this free draining material consist of 19 mm clear crushed gravel. The material beneath the slab should be hydraulically connected to the perimeter drain. A moisture barrier should underlie the slab directly above the free draining granular material.

Slab-on-grade fill compaction must be reviewed by the geotechnical engineer.

6.4 Seismic Design of Foundations

The site is considered to be generally underlain by dense to very dense soils which are consistent with Site Class C soils, in accordance with Table 4.1.8.4.A. of the 2014 Vancouver Building By-Law (VBBL). Peak ground accelerations on firm ground for the approximate site location is 0.47 g (Natural Resources Canada, Site Coordinates: 49.224 degrees North, 123.117 degrees West).

The soils beneath the proposed building are not prone to liquefaction or other forms of ground softening under the 2014 VBBL design earthquake.

6.5 Foundation Drainage

We suggest that a perimeter drainage system be installed to prevent water build-up beneath the slab-on-grade and adjacent foundation walls. Large groundwater flows are not expected and we suggest that the perimeter drain system be preliminarily designed for a groundwater inflow rate of 25 litres/minute.

The mechanical designer should confirm the actual groundwater flow during construction at the end of subgrade preparation.

6.6 Temporary Excavations

We anticipate that vertical cuts will be needed around the perimeter of the excavation, due to the proposed underground parking garage being close to the property line. Depending on final below grade plans, underpinning may be required for the neighbouring Mosaic residential development. The excavation cut will be supported using anchored shotcrete, since it is the most economical method of support available in the Lower Mainland.

Light to moderate seepage during the wetter months should be expected due to the formation of perched water tables in the surficial fills as well as sand lenses within the GLACIAL TILL. We expect that inflows may be handled with conventional sumps and sump pumps.

We anticipate slope cuts in the GLACIAL TILL will be stable at 4V to 3H and possibly steeper depending on the actual conditions encountered and the presence of groundwater, if any. Irrespective, slopes over 1.2 m high and steeper than 1V:1H require engineering review in accordance with Worksafe BC regulations.

Our experience in this area indicates that cobbles and boulders may be encountered during excavations. Cobbles and small boulders can typically be removed with conventional excavation equipment. However, large boulders may require splitting/blasting to facilitate their removal from the site.

GeoPacific will prepare an excavation/shoring design at your request, once below grade plans have been developed.

6.7 Lateral Pressure on Foundation Walls

Earth pressures against the foundation walls are dependent on factors such as lateral restraint along the wall, surcharge loads, backfill materials, compaction of the backfill and drainage conditions.

The foundation wall is expected to be partially yielding and fully restrained between floors and will be constructed directly against synthetic flat drain mat or backfilled with 0.6 m of free draining granular material. During the installation of the shoring wall, the wall is expected to partially yield, thereby mobilizing the full shear strength of the retained soil. The partial yielding of the wall causes a dilation of the retained soil, which in turn decreases the lateral stress against the foundation wall. The full development of the active condition is expected within the retained soil and can be assumed under these conditions.

We recommend that the foundation walls be designed to resist the following lateral earth pressures:

Static: *Triangular soil distribution of 5H kPa, where H is equal to the total wall height in metres.*

Seismic: *Inverted triangular soil pressure distribution of 2.5H kPa, where H is equal to the total wall height in metres.*

Irrespective of the foregoing, the minimum earth pressure should not be less than 20 kPa in the upper 1.5 metres of the foundation wall to account for transient loading encountered during construction.

The preceding loading recommendations assume that the synthetic drainage material or free draining backfill provides a drained cavity around the perimeter of the parkade. We expect that the perimeter drainage system will be connected to the drainage material and sufficiently lower the groundwater level such that hydrostatic pressures against the foundation walls are eliminated.

Any additional (surcharge) loads not specifically described herein should be added to the earth pressures given. All earth pressures are based upon unfactored soil parameters and are assumed to be unfactored loads.

The geotechnical engineer should be contacted to review foundation wall backfill materials and placement.

6.8 Re-use of Excavated Materials as Fill

We expect that the excavated soils will not be suitable for re-use, due to the high silt content.

7.0 DESIGN REVIEWS AND CONSTRUCTION INSPECTIONS

The preceding sections make recommendations for the design and construction of the residential building at 6729-6769 Cambie Street in Vancouver, B.C. We have recommended the review of certain aspects of the design and construction. It is important that these reviews are carried out to ensure that our intentions have been adequately communicated. It is also important that any contractor(s) working on the site review this document prior to commencing their work.

It is the responsibility of the contractor to contact GeoPacific a minimum of 48 hours in advance to notify us that a field review is required. In summary, field reviews are required for the following aspects of the work:

1. Stripping	Review of site stripping.
2. Excavation	Review of temporary cut slopes.
3. Shoring and Underpinning	Review of shoring and underpinning installation and anchor testing.
4. Foundation	Review of foundation subgrade.
5. Slab on-grade	Review of subgrade and underslab fill materials and compaction.
6. Backfill	Review of backfill materials and placement against foundation walls.

8.0 CLOSURE

This report has been prepared exclusively for Minglian Holdings Ltd. and the City of Vancouver for the purpose of providing geotechnical recommendations for the design and construction of the proposed development described herein and related earthworks. The report remains the property of GeoPacific Consultants Ltd. and unauthorized use of, or duplication of, this report is prohibited.

We are pleased to be of assistance to you on this project and we trust that our comments and recommendations are both helpful and sufficient for your current purposes. If you would like further details or would like clarification of any of the above, please do not hesitate to call.

For:
GeoPacific Consultants Ltd.

Reviewed By:

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
M. J. KOKAN
21364

SEP 2 9 2016

Dexter Grant, B. Eng., E.I.T.
Engineer in Training

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

CP Program

This stamp shall only operate to signify that these documents form part of the CP Project and shall not constitute an approval of design services rendered by others.

20 OCT 2016

SUSANA D. CHUI

Date Stamp

N
W E
S

LEGEND:

TH16-# – TEST HOLE (TH) LOCATION
DCPT16-#– DYNAMIC CONE PENETRATION TEST (DCPT) LOCATION
HOLE LOCATIONS ARE APPROXIMATE

SITE PLAN

SCALE = 1:500

REFERENCE:

GEOPACIFIC
VANCOUVER KAMLOOPS CALGARY
#215-1200 West 73rd Ave.
Vancouver, B.C. V6P 6G5
P 604.439.0922
F 604.439.9189

DATE: JANUARY 13, 2016		
DRAWN BY: H.S.	APPROVED BY: M.J.K.	REVIEWED BY: M.J.K.
SCALE: AS SHOWN		

PROPOSED RESIDENTIAL DEVELOPMENT
6733 CAMBIE STREET, VANCOUVER, BC
TEST HOLE LOCATION PLAN

FILE NO.: 13567
DWG. NO.: 13567-01

REVISIONS:
A.
B.
C.

APPENDIX A - TEST HOLE LOGS

Test Hole Log: TH16-01

File: 13567
Project: Proposed Residential Development
Client: Minglian Holdings Ltd.
Site Location: 6733 Cambie Street, Vancouver, BC

GeoPacific Consultants Ltd.
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth/Elev (ft)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 / 0		Ground Surface					
0		***Asphalt***	0.0				
1		***Fill*** Sand and gravel, dark brown, dense			9		
3 / 1		***Silty Sand*** Sandy silt to silty sand, dark brown, fine sand with greyish blue silt, soft to dense, becoming moist	3.0		42		
5			5.0		49		
6 / 2		***Sand*** Silty sand with gravel, dense to very dense, grey, moist			>50		DCPT refusal at 1.8 m
8				9.5			
9 / 3		@2.7 m becoming wet					
11		@4.0 m becoming moist, till-like, trace of cobbles				▼	
12 / 4				9.8			
15							
16 / 5		***Sand*** Sand, medium, saturated, dense, mottled yellow to brown	16.0	18.7			
19							
20 / 6		End of Borehole	20.0				
22							
23 / 7							
26 / 8							
27							
29 / 9							
30							

Logged: DG
Method: Solid Stem Auger
Date: January 4th, 2016

Datum: Ground Surface
Figure Number: A.01
Page: 1 of 1

Test Hole Log: TH16-02

File: 13567
Project: Proposed Residential Development
Client: Minglian Holdings Ltd.
Site Location: 6733 Cambie Street, Vancouver, BC

215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax:604-439-9189

Depth (ft)	Depth (m)	Symbol	SOIL DESCRIPTION	Depth/Elev (ft)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0	0		Ground Surface					
0	0		***Concrete***	0.0				
2			***Fill*** Crushed gravel with sand	2.0		9		
3	1		***Silty Sand*** Sandy silt to silty sand, trace gravel, brown sand, fine sand, soft to dense			28		
5						47		
6	2					>50		DCPT refusal at 1.75 m
6			***Sand*** Silty sand with gravel, grey, dense, moist, till like	6.0	7.9			
8								
9			@2.7 m wet		16.3		▼	
10	3							
12								
13	4				11			
15								
16	5		***Sand and Gravel*** Silty sand and gravel, glacial till, grey, moist, dense	16.0	10.3			
19								
20	6		End of Borehole	20.0				
23	7							
26	8							
29	9							

Logged: DG
Method: Solid Stem Auger
Date: 2016/01/04

Datum: Ground Surface
Figure Number: A.02
Page: 1 of 1

GEOPACIFIC CONSULTANTS

Vancouver Lab
#200 - 8809 Heather Street
Vancouver, BC
V6P 3T1

MOISTURE CONTENT REPORT
(ASTM D2216)

CLIENT:	MINGLIAN HOLDINGS
PROJECT:	RESIDENTIAL DEVELOPMENT
LOCATION:	6733 CAMBIE STREET, VANCOUVER

JOB #:	13567
RECEIVED:	4-Jan-16
TESTED:	4-Jan-16

HOLE #:	TH16 - 01	TH16 - 01	TH16 - 01	TH16 - 02	TH16 - 02
DEPTH:	8'	13'	17'	7'	9'
M/C:	9.5%	9.8%	18.7%	7.9%	16.3%

HOLE #:	TH16 - 02	TH16 - 02			
DEPTH:	13'	17'			
M/C:	11.0%	10.3%			

HOLE #:					
DEPTH:					
M/C:					

HOLE #:					
DEPTH:					
M/C:					

HOLE #:					
DEPTH:					
M/C:					

HOLE #:					
DEPTH:					
M/C:					

COMMENTS:

DISTRIBUTION:

Per: Maria Luyten, B.Sc.
Lab Administrator

Reviewed By: Dion Lauriente, B.A.Sc., EIT
Lab Manager