

Construction Vibration “Zone of Influence” & Pre-Construction Studies

Runnymede Health Centre

Long-Term Care Home

Proposed Institutional Building

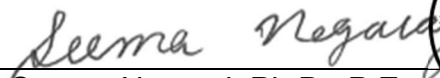
City of Toronto

June 18, 2020
Project: 119-0001-200

Prepared for


Runnymede Healthcare Centre

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Revision History

Revision #	Date	Description of Changes
1.0	June 18, 2020	Issued to Client

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Construction Vibration “Zone of Influence” and Pre-Construction Studies

Runnymede Health Centre

Long-Term Care Home

Proposed Institutional Building City of Toronto

EXECUTIVE SUMMARY

Valcoustics Canada Ltd. (VCL) has been retained to prepare Construction “Zone of Influence” (ZOI) and Pre-Construction studies for the construction of the Long-Term Care Home at Runnymede Health Centre in the City of Toronto.

This report addresses ground-borne vibration associated with the construction activities on the subject site, relative to the potential impacts on the nearby vibration sensitive uses/structures.

In summary:

- The assessment shows that the predicted ZOI extends beyond the legal boundaries of the site to the south, east and west. The ZOI includes vibration-sensitive structures outside the legal boundaries of the site to the south and east.
- Since the ZOI extends past the legal boundary of the site and more importantly includes nearby structures, the preparation of a Pre-Construction vibration study is required as per the City of Toronto By-law 514-2008, including the development of a vibration monitoring program.
- Attended monitoring is recommended at the underground services to the south of the site during construction.

The existing Runnymede Health Centre building is also within the zone of influence. Since the existing building is under the same ownership as the proposed development, vibration

monitoring is not strictly required. However, due the sensitive nature of the existing uses on the site and proximity to the caisson drilling locations, vibration monitoring is recommended.

1.0 INTRODUCTION

Valcoustics Canada Ltd. (VCL) has been retained to prepare Construction Vibration “Zone of Influence” (ZOI) and Pre-Construction vibration studies for the Long-Term Care Home at the Runnymede Health Centre in the City of Toronto.

This report addresses ground-borne vibration associated with the construction activities that will occur on site, relative to the potential impacts at nearby vibration sensitive uses/structures.

2.0 GENERAL

2.1 DESCRIPTION OF THE SITE

The proposed Long-Term Care Home will be located at the south side of the existing Runnymede Health Centre property at 625 Runnymede Road. The overall Runnymede Health Centre site is bounded by:

- A mix of commercial and residential uses to the north;
- Fisker Avenue, with existing residential dwellings beyond, to the east;
- St Johns Road, with existing residential dwellings beyond, to the south; and
- Runnymede Road, with existing residential dwellings beyond, to the west.

The site is currently used as a parking lot. Figure 1 shows the Context Plan.

2.2 CITY OF TORONTO CONSTRUCTION VIBRATION BY-LAW AND CONTROL FORM

As per Section 3.6.C(1) of Chapter 363 of the City of Toronto Municipal Code (Building Construction and Demolition), “an applicant for a permit for construction, including demolition, shall submit as part of the permit application a vibration control form”. The Vibration Control Form consists of three sections to be completed by the proponent or its representative:

- **Section A: Vibration Control** – identifies a series of construction activities of potential concern with respect to vibration, including a general category of “Any other construction activity or method that has the potential to cause vibrations which may impact on buildings or structures outside of the construction site.....”.
- **Section B: Preliminary Study as required by Chapter 363** – if any of the activities identified in Section A will occur (answers to any of the questions in Section A are “YES”), then a Preliminary Construction Vibration Study (as per Section B) is required. The preliminary vibration study must identify the potential ZOI beyond the legal boundaries of the construction site and any buildings/structures within the ZOI, as well as noting buildings designated under the Ontario Heritage Act.

- **Section C: Pre-Construction Consultation and Monitoring Program** – provides additional requirements regarding monitoring, reporting, public consultation, and inspection of adjacent existing structures/buildings, if the ZOI extends beyond the legal boundaries of the construction site.

The requirements of the Vibration Control Form are based on Section 3.6.C of Chapter 363 of the Municipal Code.

Appendix A includes the executed Vibration Control Form for this site.

3.0 ZOI ASSESSMENT

3.1 VIBRATION CRITERIA

3.1.1 City of Toronto By-Law 514-2008

Section B of the Vibration Control Form (and the related text in Section 3.6.C of Chapter 363 of the Municipal Code) requires that a plan be prepared showing the construction site, the adjacent lands, and the ZOI of the construction activity. The ZOI is defined as the area of land within or adjacent to the construction site that may be impacted by vibrations emanating from a construction activity, where the peak particle velocity due to a construction activity measured at a point of reception is equal to or greater than 5 mm/s at any frequency or, such greater area where specific site conditions warrant, as are identified by the professional engineer preparing the preliminary vibration study.

The City of Toronto By-Law 514-2008 ZOI criteria and vibration limits are shown in Table 1 below.

TABLE 1: BY-LAW ZOI CRITERIA AND VIBRATION LIMITS

Source	Vibration Peak Particle Velocity (mm/s)			
	ZOI Criteria	Vibration Limits During Construction		
	Any Frequency	Less than 4 Hz	4 Hz to 10 Hz	More than 10 Hz
By-law 514-2008	5	8	15	25

3.1.2 Vibration Limits for Heritage/Sensitive Buildings

It should be noted that the 5 mm/s criteria may not be appropriate for a sensitive building such as a historical building. In this case, the heritage designation indicates that a lower vibration criterion may be more appropriate for this structure. The German Standard DIN 4150-3 (Reference 1) suggests that the criteria shown in Table 2 below should be used to protect sensitive structures from “minor damage” (cracking of plaster, etc.).

TABLE 2: GUIDELINE VIBRATION LEVELS FOR SENSITIVE STRUCTURES

Type of Structure	Guideline Value for velocity (foundation), mm/s		
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz
Sensitive	3	3 to 8	8

3.1.3 Construction in the Vicinity of Natural Gas Facilities

According to Enbridge's "Third Party Requirements in the vicinity of Natural Gas facilities", dated October 2007, the peak particle velocity measured on a pipeline must not exceed 50 mm/s. Also, the maximum displacement must not exceed 50 mm.

3.1.4 Construction Near the City of Toronto Bridges, Sewers and Water Mains

According to the City of Toronto's "Requirements for Construction Work Near City of Toronto Bridges, Sewers and Watermains", dated December 10, 2007, the maximum allowable vibration levels at the structure (bridges, sewers and water mains) are shown in Table 3 below.

TABLE 3: VIBRATION LIMITS AT CITY OF TORONTO STRUCTURES

Structures	Maximum Allowable Vibration Levels During Construction, mm/s
Old ⁽¹⁾ Truck sewer/watermain	10
Modern truck sewer/watermain	25
Old bridge ⁽¹⁾ (old construction methods/materials)	10
Modern bridge (steel, reinforced concrete)	25

Note:

(1) "Old", as defined here, is related both to the age and condition of the structures. Old pipes and bridges are the structures that were constructed with old methods/materials, such as lined tunnel, brick, clay, cast iron for pipes; and brick and wood for bridges. The "old" structures also refer to the structures that have high failure rates due to accelerated ageing process.

3.2 SOURCES OF CONSTRUCTION VIBRATION

Caissons will be drilled around the full perimeter of the proposed building. The shoring drawing set, prepared by RWH Engineering Inc., dated April 30, 2020 ("Issued for Building Permit Submission") is included as Appendix B.

Other construction activity on the site is expected to be either lower in vibration magnitude, or further removed from the site boundary such that the impact at the site boundary would be less than that from the caisson drilling.

3.3 NEARBY HISTORICAL BUILDINGS

The City of Toronto Heritage Property Database shows that there are no buildings in the vicinity of the site with heritage designations.

3.4 SEWERS, GAS AND WATER MAIN STRUCTURES

Based on the Key Plan from the shoring drawing set, there are underground services to the south, east and west of the site. The closest structure is approximately 3.0 m from the south property line. These structures have been included in the assessment.

3.5 PREDICTED ZOI

3.5.1 Vibration Propagation

The vibration propagation model used for this site assumes subsurface conditions that promote the “efficient propagation of vibration”, based on the procedures found in Reference 2, and the geotechnical (soils) report for this site (Reference 3). The subsurface conditions noted in the soils report suggests this site (area) is a candidate for the efficient propagation of ground vibration. This conclusion is based on groundwater being located within approximately 8.7 m of the surface. Relative to propagation for standard subsurface conditions, efficient propagation can result in vibration levels up to 10 dB higher. To be conservative, this assessment assumes efficient propagation and therefore a +10 dB adjustment has been applied, which has the net effect of increasing the setback to the 5 mm/s criteria (i.e. a larger ZOI).

Since the vibration velocities presented in this report are based on predictive methods, they should be considered as an approximation, but are representative of what can be expected.

3.5.2 Construction ZOI

The potential construction ZOI has been determined by prediction, using reference ground vibration velocities for the sources noted in Section 3.2 above, and the extrapolation methods from Reference 2, which provides reference data on vibration from various construction activities. The reference ground vibration velocity for caisson drilling is 2.3 mm/s (peak particle velocity – PPV) at 7.6 m.

The extent of the ZOI is based on the maximum PPV at any location off-site caused by any construction activity on-site. It is assumed that significant construction activities do not occur simultaneously, and as such vibration velocities are considered independently rather than additively (for example, caissons are drilled one at time).

Figure 2 shows the ZOI for the entire construction site based on caisson drilling activities at locations depicted on the shoring plan.

As shown on Figure 2, the ZOI extends beyond the legal boundaries of the site to the south, east and west. The ZOI includes underground structures to the south and east.

The ZOI also includes the existing Runnymede Health Centre building on the site.

4.0 PRE-CONSTRUCTION (VIBRATION) ASSESSMENT

This pre-construction assessment addresses only the vibration related aspects of Part C(11) of the City of Toronto Vibration Control Form; the non-vibration components (consultation and building inspection) are not included in this assessment and are addressed by others.

4.1 AMBIENT VIBRATION

The most significant sources of ambient vibration in the area are the vehicular traffic on Runnymede Road, St Johns Road and Fisker Avenue. The levels of ambient vibration from these sources are expected to be well below the vibration criteria indicated in Table 1.

4.2 VIBRATION MONITORING PROGRAM

The predicted ZOI for construction extends beyond the legal boundaries of the site in all directions. In accordance with the requirements of Chapter 363 of the Municipal Code, monitoring of the construction related ground borne vibration is required since the predicted ZOI extend beyond the legal boundaries of the site, and more importantly includes several nearby sensitive structures.

As noted above, in the case of construction activity, ZOI predictions should be considered approximate. Thus, a monitoring program is important in order to ensure that vibration at nearby structures do not exceed the acceptable thresholds due to construction activity on site.

4.2.1 Underground Services

In general, the vibration criteria for below grade structures such as water mains, gas mains, etc. are higher in magnitude than the 5 mm/s criterion used in the ZOI analysis. For example, according to the City of Toronto guideline for sewers and water mains (see Section 3.1.2 above), the vibration criterion for a modern water main (independent of frequency) is 25 mm/s. Thus, it is not necessarily practical to use the 5 mm/s criterion for determining the ZOI with regard to underground structures (that is, the ZOI for underground structures is smaller due to the higher vibration threshold). Rather, a ZOI criterion of 15 mm/s may be more appropriate in this case (60% of the damage criterion for water mains which is analogous to the By-Law ZOI criterion of 5 mm/s).

Based on the information above, short-term attended monitoring is recommended at the gas main to the south.

The recommended duration at the monitoring location may vary, depending on site conditions and the order in which the caissons are drilled. The recommendations can be refined after construction commences and an initial round of short-term monitoring has been done.

4.2.2 General Notes for Attended Monitoring

As indicated in the City of Toronto's "Requirements for Construction Work Near City of Toronto Bridges, Sewers and Watermains", dated December 10, 2007, a vibration criterion of 25 mm/s should be used with the "cautionary" limit set to 15 mm/s. If the cautionary limit is exceeded, the site supervisor would be notified immediately, and modifications to the operation to mitigate the vibration levels would be discussed.

It is expected that underground structures will not be exposed during construction. Thus, it is recommended that (where possible) the transducer be dug into the ground such that it is approximately 300 mm below grade. The transducer would then be affixed to the soil using both ground spikes (provided with the equipment) as well as a sand bag.

Also, it should be noted that the provided extent of the 3 mm/s, 5 mm/s and 15 mm/s contours include a 10 dB propagation penalty based on soil conditions that may promote the efficient propagation of ground vibrations. As this penalty may be considered conservative, it is possible that actual vibration levels exhibited during construction may not be as high as those predicted in the ZOI analysis.

4.2.3 Existing Runnymede Health Services Building

The existing Runnymede Health Services building to the north of the proposed development is within the ZOI. Since the existing building is under the same ownership as the proposed development, vibration monitoring is not strictly required at this location. However, due to the sensitive nature of the existing use and the proximity to the caisson drilling locations, vibration monitoring is recommended at the existing building.

4.3 VIBRATION CONTROL MEASURES

Potential vibration mitigation measures for these types of construction activities are rather limited. For construction, options may include drilling at a lower rotation speed to reduce the ground vibrations.

Specific vibration mitigation measures are best addressed during construction, based on the actual measured vibration velocity magnitude, specific equipment and staging being used and equipment location(s).

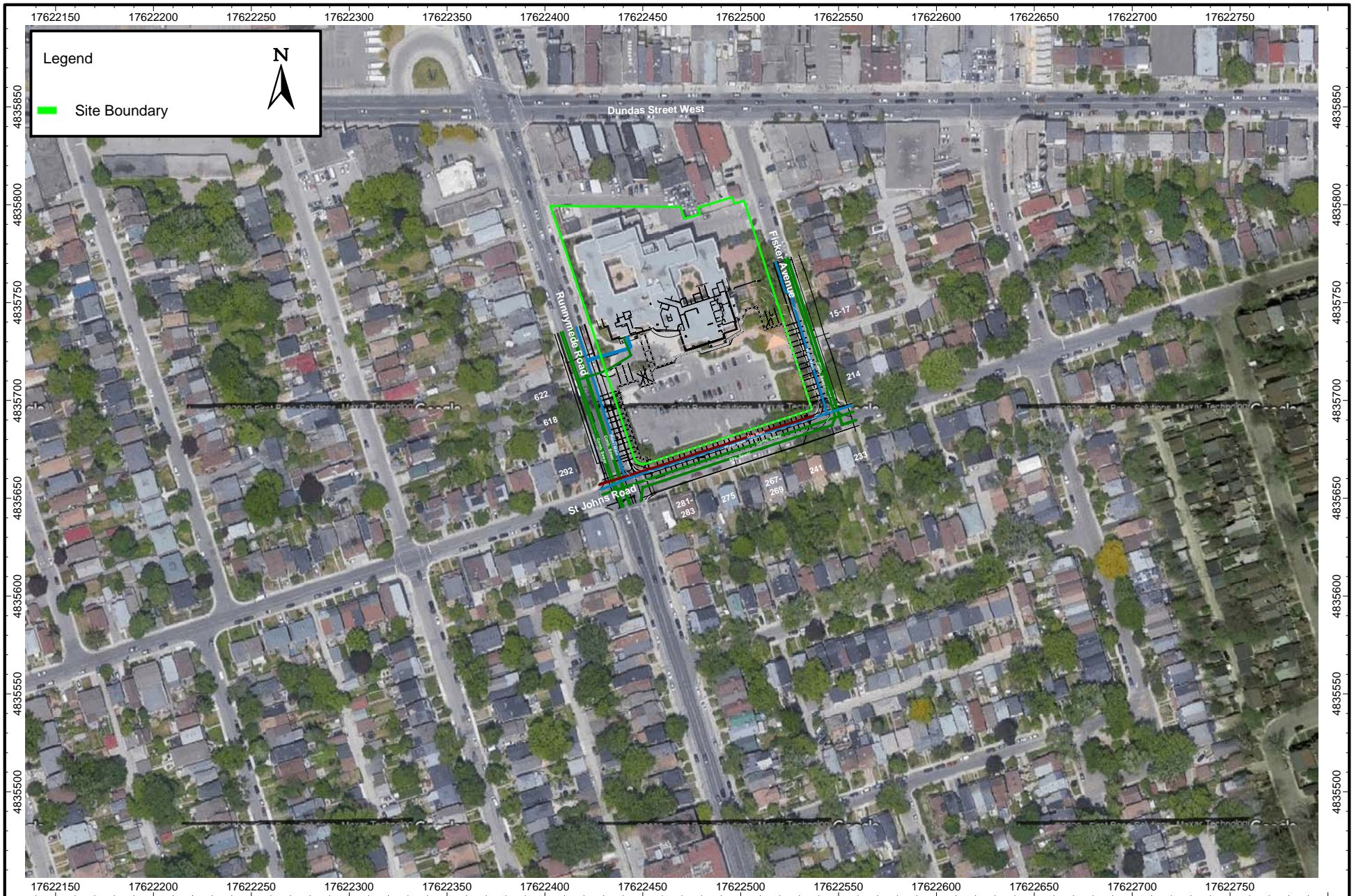
5.0 CONCLUSIONS


The predicted ZOI during caisson drilling extends beyond the legal boundaries of the site to the south, east and west. The ZOI includes underground structures to the south and east.

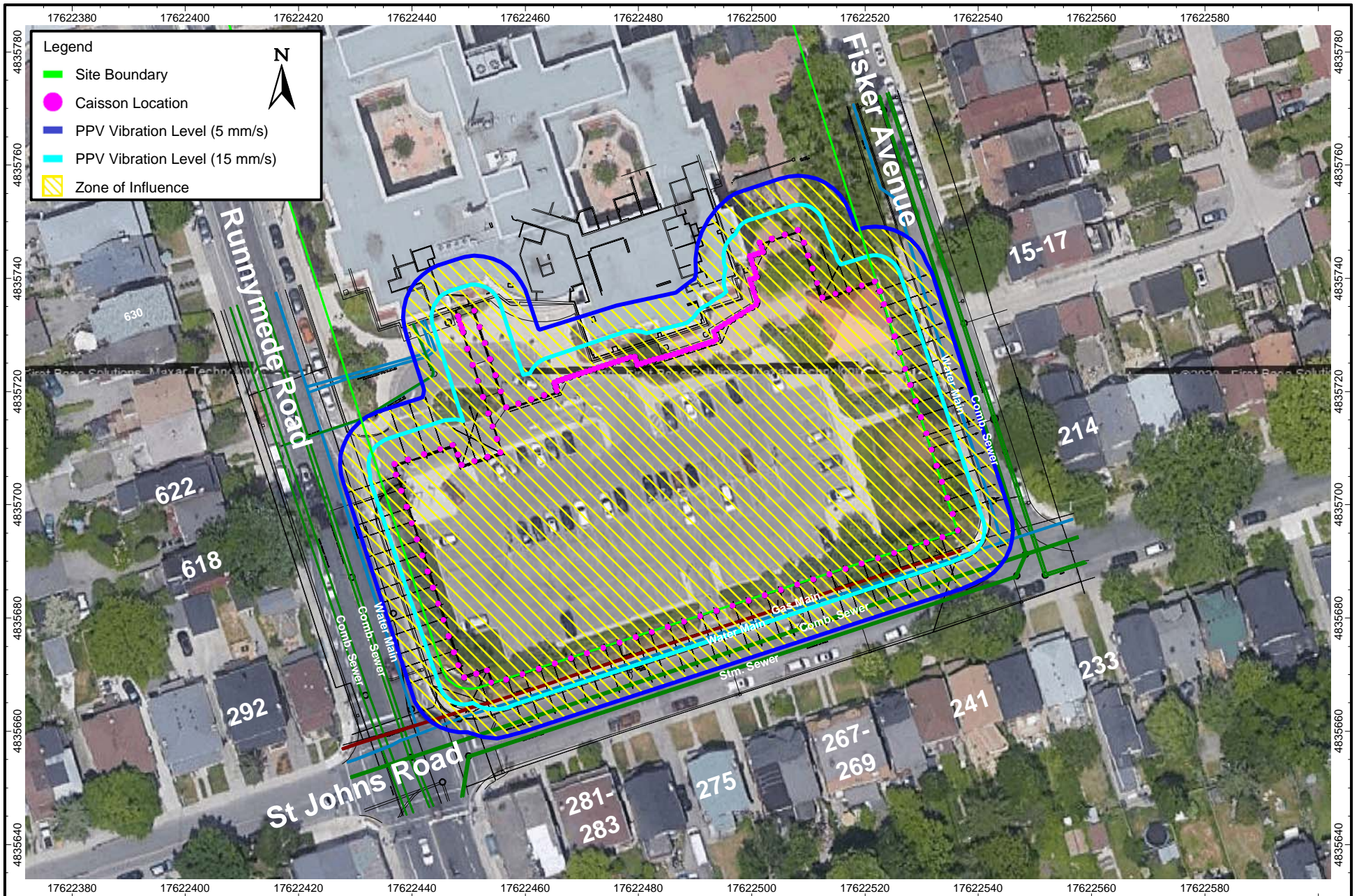
Attended monitoring is required at the underground services to the south. It is recommended that unattended monitoring be done at the existing Runnymede Health Centre building on site due to the sensitive nature of the existing uses.


6.0 REFERENCES

1. DIN 4150-3, "Structural Vibration, Part 3: Effects of Vibration on Structures", Deutsche Norm, February 1999.
2. "High Speed Ground Transportation Noise and Vibration Impact Assessment", Harris Miller, Miller and Hanson Inc., October 2005.
3. "Updated Geotechnical Investigation and Engineering Design Report, Runnymede Healthcare Centre, Long-Term Care Building, 625 Runnymede Road, Toronto, Ontario", Terraprobe Inc., April 15, 2020.



	Title	Date	Figure 1
	Context Plan	June 11, 2020	
	Project Name	Project No.	
	Runnymede Health Centre - Long-Term Care Home	119-0001-200	



 VALCOUSTICS Canada Ltd. consulting acoustical engineers	Title Zone of Influence (ZOI) - Construction		Date June 11, 2020	Figure 2
	Project Name Runnymede Health Centre - Long-Term Care Home		Project No. 119-0001-200	

APPENDIX A

VIBRATION CONTROL FORM

Folder No.

District Offices

☐ Toronto and East York

☐ North York

☐ Scarborough

☐ Etobicoke York

PART A – To be Completed by Owner

Project Description

Address of Project

WHEREAS the Ontario Building Code requires that the project described above be designed and reviewed during construction or demolition by an architect, professional engineer or both that are licensed to practice in Ontario;

WHEREAS Ontario Law prohibits the construction or demolition of a building if a permit has not been issued to authorize it, and

WHEREAS Architects and engineers are prohibited by law from undertaking reviews if a permit has not been issued,

NOW THEREFORE the Owner, who intends to construct or demolish or have the building constructed or demolished hereby confirms that:

1. The undersigned architect and/or professional engineers have been retained to provide general reviews of the construction or demolition of the building to determine whether the work is in general conformity with the plans and other documents that form the basis for the issuance of a permit, in accordance with the performance standards of the Ontario Association of Architects (OAA) and/or Professional Engineers of Ontario (PEO);

2. All general review reports by the architect and/or professional engineers will be forwarded promptly to the Chief Building Official;

3. Should any retained architect or professional engineer cease to provide general reviews for any reason during construction or demolition, the Chief Building Official will be notified in writing immediately, and another architect or engineer will be appointed so that general review continues without interruption; and

4. Construction or demolition will only be undertaken if an architect and/or professional engineers are retained to undertake general review, and a permit authorizing the proposed construction or demolition has been issued.

The undersigned hereby certifies that he/she has read and agrees to the above.

Owner's First Name

Last Name

Street No.

Street Name

Postal Code

Telephone No.

Mobile No.

Fax No.

Signature of Owner
(Or authorized agent)

Print Name

Date (yyyy-mm-dd)

Co ordinator of the work of all consultants

Street No.

Street Name

Postal Code

Telephone No.

Mobile No.

Fax No.

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The personal information on this form is collected under the City of Toronto Act, S.O. 2006, Chapter 11, Schedule A, s. 136 (b) & (c) and the Ontario Building Code Act, 1992 Chapter 23. The information collected will be used for processing applications and creating aggregate statistical reports. Questions about this collection may be referred to the Customer Service Manager in the appropriate district. Toronto East York District, 100 Queen Street West, Ground Floor, West Tower, Toronto M5H 2N2, (416) 392-7539; North York District, 5100 Yonge Street, 1st Floor, Toronto M2N 5V7, (416) 395-7000; Etobicoke York District, 2 Civic Centre Court, 1st Floor, Toronto M9C 2Y2, (416) 394-8002, Scarborough District, 150 Borough Drive, 3rd Floor, Toronto M1P 4N7, (416) 396-7526

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Commitment to General Reviews

PART B – To be completed by Consultants

The undersigned architect and/or professional engineer(s) hereby certify that they are qualified in and have been retained to provide general reviews of the parts of construction or demolition of the building indicated, to determine whether the work is in general conformity with the plans and other documents that form the basis for the issuance of a permit, in accordance with the performance standards of the OAA and/or PEO.

<input type="checkbox"/> Architectural			<input type="checkbox"/> Structural			<input type="checkbox"/> Mechanical			<input type="checkbox"/> Electrical			<input type="checkbox"/> Site Services		
<input type="checkbox"/> Other:														
Signature				Print Name				Date (yyyy-mm-dd)						
Street No.		Street Name						Postal Code						
Telephone No.				Mobile No.				Fax No.						

<input type="checkbox"/> Architectural			<input type="checkbox"/> Structural			<input type="checkbox"/> Mechanical			<input type="checkbox"/> Electrical			<input type="checkbox"/> Site Services		
<input type="checkbox"/> Other:														
Signature				Print Name				Date (yyyy-mm-dd)						
Street No.		Street Name						Postal Code						
Telephone No.				Mobile No.				Fax No.						

<input type="checkbox"/> Architectural			<input type="checkbox"/> Structural			<input type="checkbox"/> Mechanical			<input type="checkbox"/> Electrical			<input type="checkbox"/> Site Services		
<input type="checkbox"/> Other:														
Signature				Print Name				Date (yyyy-mm-dd)						
Street No.		Street Name						Postal Code						
Telephone No.				Mobile No.				Fax No.						

<input type="checkbox"/> Architectural			<input type="checkbox"/> Structural			<input type="checkbox"/> Mechanical			<input type="checkbox"/> Electrical			<input type="checkbox"/> Site Services		
<input type="checkbox"/> Other:														
Signature				Print Name				Date (yyyy-mm-dd)						
Street No.		Street Name						Postal Code						
Telephone No.				Mobile No.				Fax No.						

Folder No.

District Offices

☐ Toronto and East York

☐ North York

☐ Scarborough

☐ Etobicoke York

PART A – To be Completed by Owner

Project Description

Address of Project

WHEREAS the Ontario Building Code requires that the project described above be designed and reviewed during construction or demolition by an architect, professional engineer or both that are licensed to practice in Ontario;

WHEREAS Ontario Law prohibits the construction or demolition of a building if a permit has not been issued to authorize it, and

WHEREAS Architects and engineers are prohibited by law from undertaking reviews if a permit has not been issued,

NOW THEREFORE the Owner, who intends to construct or demolish or have the building constructed or demolished hereby confirms that:

1. The undersigned architect and/or professional engineers have been retained to provide general reviews of the construction or demolition of the building to determine whether the work is in general conformity with the plans and other documents that form the basis for the issuance of a permit, in accordance with the performance standards of the Ontario Association of Architects (OAA) and/or Professional Engineers of Ontario (PEO);

2. All general review reports by the architect and/or professional engineers will be forwarded promptly to the Chief Building Official;

3. Should any retained architect or professional engineer cease to provide general reviews for any reason during construction or demolition, the Chief Building Official will be notified in writing immediately, and another architect or engineer will be appointed so that general review continues without interruption; and

4. Construction or demolition will only be undertaken if an architect and/or professional engineers are retained to undertake general review, and a permit authorizing the proposed construction or demolition has been issued.

The undersigned hereby certifies that he/she has read and agrees to the above.

Owner's First Name

Last Name

Street No.

Street Name

Postal Code

Telephone No.

Mobile No.

Fax No.

Signature of Owner
(Or authorized agent)

Print Name

Date (yyyy-mm-dd)

Co ordinator of the work of all consultants

Street No.

Street Name

Postal Code

Telephone No.

Mobile No.

Fax No.

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Applicant Declaration

Address of Construction and/or Demolition		
Street No.	Street Name	Postal Code
First Name I,		Last Name
<div>do hereby declare:</div> <div>(confirm the following by checking off each box)</div> <div><div><input type="checkbox"/> that I am the owner/authorized agent of the owner named in the above application for a permit.</div><div><input type="checkbox"/> that the information supplied by me in the application and in the materials filed by me with the application is correct.</div></div> <div>If the answer to any of questions in Section A is YES:</div> <div><div><input type="checkbox"/> that I will ensure that monitoring of vibrations levels during construction is in accordance with the monitoring program submitted with the application for a permit</div><div><input type="checkbox"/> that I understand the requirements of City of Toronto By-law 514-2008 with respect to the public communications and complaint protocol, including the provisions for notice to the ward councillor, owners and occupants of properties within the zone of influence one week before the commencement of construction and/or demolition activity that may cause vibrations.</div></div> <div>If the answer to all of questions in Section A is NO:</div> <div><input type="checkbox"/> that I understand that if a construction activity that was not identified on this form is proposed or commenced, or if a nearby heritage building could be adversely affected, I shall comply with the requirements of Municipal Code 363-3.6, where in the opinion of the Chief Building Official the construction activity may contribute to excessive vibrations.</div> <div>And I hereby certify conscientiously believing the above is correct.</div> <div><div>Signature</div><div>Print Name</div><div>Date (yyyy-mm-dd)</div></div>		
Building or Demolition Permit Application No.		

The personal information on this form is collected under the City of Toronto Act, S.O. 2006, Chapter 11, Schedule A, s. 136 (b) & (c) and the Ontario Building Code Act, S.O. 1992, Chapter 23. The information collected will be used for processing applications and creating aggregate statistical reports. Questions about this collection may be referred to the Customer Service Manager in the appropriate district. Toronto East York District, 100 Queen Street West, Ground Floor, West Tower, Toronto M5H 2N2; North York District, 5100 Yonge Street, 1st Floor, Toronto M2N 5W4; Etobicoke York District, 2 Civic Centre Court, 1st Floor, Toronto M9C 2Y2; Scarborough District, 150 Borough Drive, 3rd Floor, Toronto M1P 4N7.
Phone: (416) 397-5330

APPENDIX B

SHORING PLAN

NOTES

A. Design Parameters:

Soils:
γ = 20 kN/m³
K_a = 0.31 For Soil
0.47 Next to Adjacent Buildings
K_p = 9.54
q_i = 12 kPa

- Shoring design is based on drained conditions (i.e. No hydrostatic forces).
- Shoring designs are intended to be temporary and have a limited design life. Design assumes the permanent structure be constructed within 8 months upon completion of excavation.
- Any proposed supernormal loads such as crane outriggers or excavators applied to the top of the shoring, other than indicated on these drawings, must be provided for review and acceptance by RWH prior to placement.
- Design is based on the assumption that the existing structure foundation configurations, elevations and loads (if specified) as indicated on the shoring drawings are correct. Should any of these assumptions change a redesign of the shoring may be required.
- Anchor design adhesion = 70 kN/m for post grouted soil anchors. To be verified by testing. Testing program to be prepared by RWH. Number of post-grout cycles to achieve design adhesion to be determined by the shoring contractor.
- Design is in accordance with the structural requirements of the Ontario Building Code and the Canadian Highway Bridge Design Code.
- All work is to be carried out in accordance with the Occupational Health and Safety Act.

B. Materials:

- Structural steel design, connections, fabrication and erection is to conform to requirements of CSA S16.1, S136, the Canadian Institute of Steel Construction (CISC) "Code of Standard Practice for Buildings".
- Structural steel to be new or sound material and conform to CSA CAN3-640.21, Grade 350W for wide flanges, channel and hollow structural sections and Grade 300W minimum for plates, angles and all other shapes.
- Alternative sections or grades of equivalent strength may be substituted subject to approval by RWH.
- Welding to conform to CSA W59 and be performed by certified welders.
- Concrete strengths to be as follows unless noted:

Piles and Lagging:
Pile Toes 20.0 MPa;
Fill Above Pile Toes 0.4 MPa;

Caisson Wall:
Pile Toes 4.0 MPa;
Fill Above Pile Toes 4.0 MPa;
Fillers 4.0 MPa;

Raker Pads 20.0 MPa;
Anchorages 30.0 MPa;

Note: Anchorage grout to reach 50% of the final strength at three days.

- Concrete materials, mixing, handling, design, formwork, rebar, placement, cutting and finishing to comply with CSA CAN3-A23.1, 2 & 3, unless modified in writing by RWH.
- Anchors shall be fabricated from the following materials: ASTM A122 Ø30/1035MPa (designated by diameter in mm i.e. 36mm Threadbar) or ASTM A615 S17/640MPa (designated by # i.e. #11 Threadbar) or ASTM A615 500MPa (designated by R#) or ASTM A416 F=1264 MPa, A=140mm² per strand (designated as Strand). Exact sizes as shown in sections or when not shown to be chosen later for loads shown in the schedule.
- Lagging to be 75mm timber lagging unless noted otherwise.

C. Piles and Lagging and Caisson Wall Construction Procedures:

- Drill holes to sizes and depths indicated employing liners, mud drilling and/or other methods as required to avoid the ingress of soil or groundwater. Install piles plumb and to line. Fill holes with concrete strength as specified above.
- Pile to be installed within 75mm tolerance from plan location and pile to be plumb within 0.5% of the excavated height in all directions.
- Excavate in stages to suit shoring work.
- Excavate installing lagging in maximum 1500mm lifts or as specified by RWH. Should caving or raveling occur, reduce lift height. Leave a 1:1 berm above the excavation elevation. Leave no excavation open overnight. In the case of caisson wall trim face as required.
- Where timber lagging is used, fill all voids behind lagging with excavated or imported granular material rammed in place or use lean mix.
- Do not excavate more than 600mm maximum below support level. Install tiebacks, walers, rakers, raker pads and/or struts as specified on the drawings. Walers to be installed prior to raker and strut installation.
- Tieback drilling method to be selected to prevent ground loss.
- When grouting tiebacks, if grout takes are observed to be higher than the theoretical volume RWH to be notified prior to continuing with installation.
- In advance allow for anchor performance load test to 200% of the design load. Perform one load test along each shoring wall or as directed by RWH. Allow for additional strand/bar capacity as required to facilitate testing. Production tieback lengths may require modification based on testing results. RWH to be present during performance testing.
- Proof test all anchors to 133% of the design load shown in section or schedule not less than 12 hours after installation. Anchor must hold load for 10 minutes with less than 2mm creep. Lock off anchor at 105% of the design load. RWH to be present during anchor stressing.
- Maintain tieback strands/bars in good order to allow for re-stressing if necessary.
- Pre-load all rakers installed adjacent to an existing building or as specified. Rakers to be pre-loaded to 50% of the design load not less than 12 hours after installation under typical conditions.
- Tiebacks, braces and/or rakers are to be installed without delay to minimize shoring movements.
- Do not continue excavation until support installation is complete and/or design load locked off in the case of tiebacks or preloaded (if required) in the case of rakers and braces.
- Continue to final excavation level following the same procedure as outlined above.

- Construct the basement structures and ground floor slab. Properly backfill the completed structures to grade.
- Removal of any shoring elements to be reviewed and approved by RWH prior to proceeding with work.
- In the case of piles and lagging, in wet ground provide spacers to create 10mm gaps between individual lagging boards, place filter material behind lagging to allow passage of water without loss of soil fines.
- In the case of caisson wall, in wet ground install keep holes. Keep holes are intended to provide drainage for relief of hydrostatic pressure behind the caisson wall. Minimum 50mm dia. holes at 3000mm c/c each way or as directed by RWH.
- General Contractor:
- Complete a pre-construction condition survey of all adjacent structures within the influence of the excavation.
- Verify the existing foundation configurations and elevations of all adjacent structures during the demolition phase of the work. Report any discrepancies to RWH prior to the start of the shoring installation.
- Secure appropriate encroachment agreements and permits where shoring components extend beyond the project property limits.
- Elevation of site grades and underside of footings to be coordinated with structural and architectural drawings by the General Contractor prior to the beginning of shoring installation.
- Locate and identify all existing underground and/or overhead services and structures within the influence of the shoring. General Contractor to confirm location of services as shown on the drawings in both plan and elevation. All services to be checked against service drawings and site locates provided by One Call Locates. Inverts of services must be checked on site at manholes and other available locations.

- Confirm in writing that no discrepancies exist from the information presented on the drawings. Report any discrepancies and/or additional services discovered and advise of any potential interferences with shoring components to RWH prior to the beginning of shoring works. General Contractor to protect, relocate or replace services as required.

- Excavate in advance to remove any underground obstructions that will interfere with shoring installation, backfill and compact voids.
- Reduce grade to top of shoring. Provide and maintain a level working surface adequate for shoring equipment and build up working platforms as required.
- Provide layout information such that shoring elements can be located and constructed in all three dimensions. Layout shoring including all pile locations and check all dimensions. General location of shoring and building layout to be done from architectural drawings. Do not use shoring drawings alone to lay out piles. Report any discrepancies or inconsistencies to RWH prior to proceeding with shoring installation.
- Excavation must be kept dry at all times, where necessary dewater in advance to lower the water table to a minimum of 1m below the lowest excavation level to eliminate negative impact on shoring operations. Shoring is not designed to accommodate a water table above the bottom of excavation or to retain water unless specified otherwise.
- Protect shoring and/or soil face from erosion as required. Redirect water away from the top of the shoring as required to prevent material washout behind the shoring wall.
- Protect shoring and/or soil face from the effects of freezing as required. Minimum R2 frost blankets must be available on site should use be necessary. Heating may be required to combat frost effects.

- Excavation:
- General Contractor to flag installed shoring system below grade prior to excavation. Excavator to dig in lifts and follow procedures as outlined in the shoring construction procedures and the configurations of typical excavation berming details when shown on the drawings. Do not over-excavate beyond the design or Shoring Contractors requirements.
- General Contractor to supervise Excavators trim line at shoring face. Do not excavate within 3000mm of shoring face unless Shoring Contractor is present.
- Excavator to exercise care when digging near stressed anchors and rakers.
- Excavator to report any wall breaches or shoring damage immediately. Backfill and berm material at any such locations and report to the Shoring Contractor, General Contractor and RWH. Do not continue with further excavation in the area.

- Monitoring (By General Contractor):
- Provide complete vertical and horizontal movement precision monitoring of the shoring. Monitoring shall include but is not limited to the following:
 - Unless otherwise noted provide targets at the top of all piles or on the top row of every second panel in the case of shotcrete shoring. Installation of inclinometers at the discretion of RWH.

(On shoring wall install one inclinometer (or as directed by RWH) in the middle of the wall. Inclinometer depth to be to the base of the pile toe.)
 - Take target readings with an accuracy of ± 2mm for vertical and horizontal movement. Readings to be taken weekly during active excavation activities or as otherwise specified by RWH. At the discretion of RWH, and if felt necessary for the safety of the project, readings be taken more frequently and/or at critical stages of the excavation. Monitoring frequency throughout construction to be stepped down as directed by RWH.
 - Express the readings clearly in spreadsheet and graphical form and in mm only. Positive movements are into the excavation and down. For each weekly reading the spreadsheet should show the location change of each target from the last reading and from the first reading. The spreadsheet should also show the reading history.
 - Provide preconstruction survey of all adjacent structures that are in the influence of the excavation and/or may be affected by shoring operations. Provide target monitoring of all buildings to detect damage or settlement for the duration of shoring operations. Readings to be taken weekly during active excavation activities or as otherwise specified by RWH. Monitoring frequency throughout construction to be stepped down at the discretion of RWH.
 - If targets are found to be obstructed or damaged at a reading, reestablish before next reading and report to RWH.
 - All monitoring reports to be distributed promptly to RWH and Shoring Contractor.

G. References:

- Geotechnical Report:
As produced by Terraprobe dated May 13, 2019 Project Number/File Number: 1-19-0116-01.
- Structural:
Drawings SO-01 to SO-02 dated Apr. 17, 2020 by exp.
- Architectural and Civil:
Drawings AO-00 to AO-05 dated Apr. 9, 2020 by Montgomery Sisam Architects Inc.

Drawings SK-N, SK-X5, SK-O, SK-S dated Mar. 27, 2020 by Counter point Engineering.

Drawings SK-S dated Apr. 1, 2020 by Counter point Engineering.

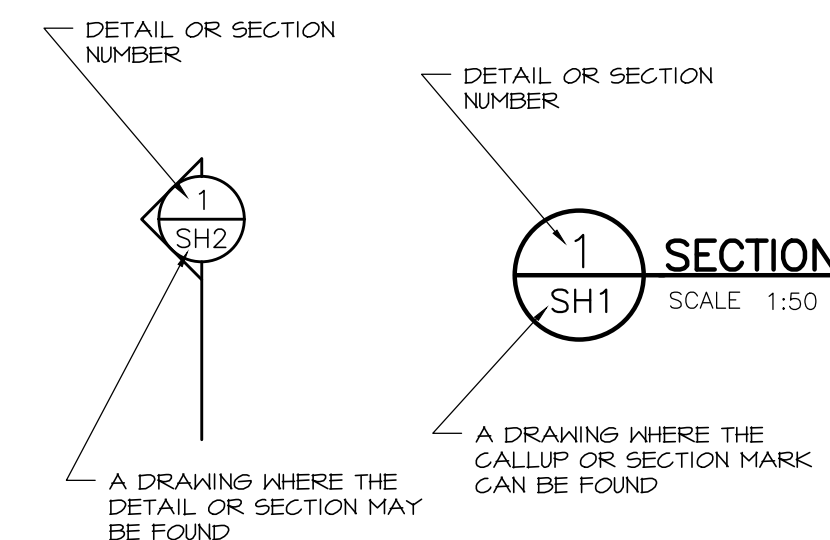
Structural, Architectural and Geotechnical Consultants to check that documents noted above have not significantly changed.

PILE SCHEDULE

Pile No.	Pile Size	Top of Pile Elev.	Bottom of Pile Elev.	Length (mm)	Hole Diameter (mm)
NORTH WALL					
N1-N6	W410x54	119.50	111.90	7600	1000
N7-N10	W530x92	119.50	108.36	11140	1000
N11	W530x92	119.50	107.95	11550	1000
N12-N17	W410x74	119.43	107.95	11480	1000
N18-N21	W410x74	119.43	108.36	11070	1000
N22-N26	W410x74	119.43	107.78	11650	1000
N27-N31	W460x177	119.56	107.78	11780	1000
N32-N39	W530x123	119.56	107.78	11780	1000
N40	2-W410x74	119.56	107.78	11780	1000
N41-N43	W530x123	119.56	107.78	11780	1000
N44-N45	W410x67	119.00	109.40	9600	1000
EAST WALL					
E1-E16	W410x67	118.54	109.40	9140	1000
SOUTH WALL					
S1-S28	W460x74	118.44	108.86	9580	1000
S29	W530X82	118.44	108.36	10080	1000
S30	2-W410x54	118.44	108.36	10080	1000
S31	W530X82	118.44	108.36	10080	1000
WEST WALL					
W1-W5	W530X82	118.44	108.36	10080	1000
W6-W13	W530X82	118.62	108.36	10260	1000
W14-W19	W530X82	119.00	108.86	10140	1000
W20	2-W410x54	119.00	108.86	10140	1000
W21-W22	W530X82	119.00	108.86	10140	1000
W23	2-W410x60	119.00	108.36	10640	1000
W24-W26	W530x92	119.00	108.36	10640	1000
W27-W32	W410x67	119.38	111.90	7480	1000

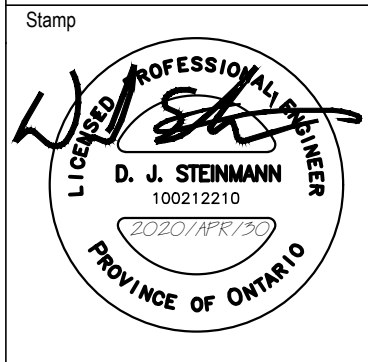


CROSSREFERENCING CONVENTION



No.	Description	Date
REVISION		
5.	ISSUED FOR BUILDING PERMIT SUBMISSION	20/04/30
4.	RE-ISSUED FOR CLASS C COSTING	20/01/15
3.	ISSUED FOR RHC REVIEW	19/11/07
2.	ISSUED FOR 66% CD	19/11/01
1.	ISSUED FOR 33% CD & RHC REVIEW	19/09/25
0.	ISSUED FOR DISCUSSION	19/09/12

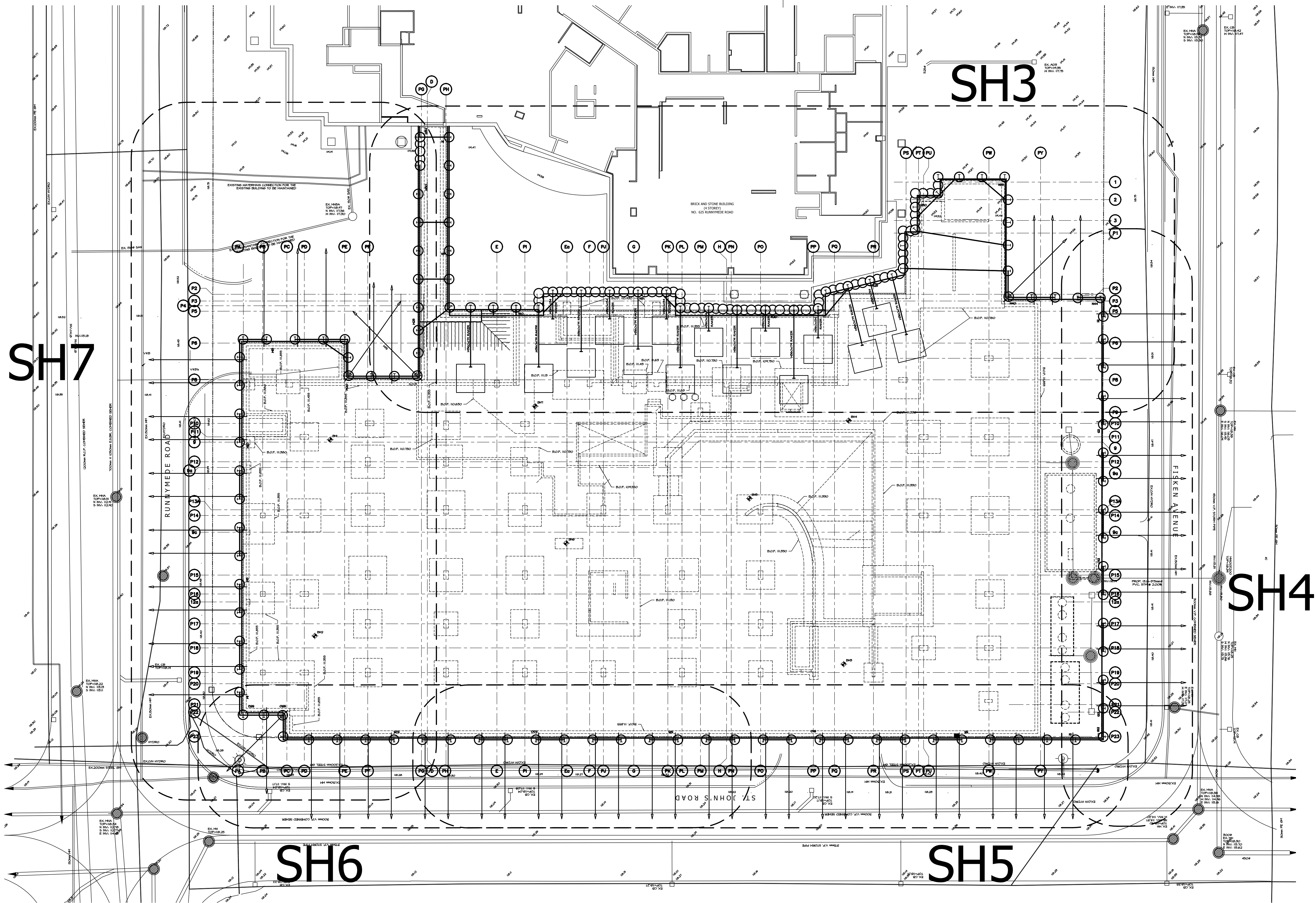
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Client	
INNOVIA CORPORATION	
Consultant	
RWH ENGINEERING INC 126 Earl Thompson Road, Ayr, ON N0B1E0 Telephone (416) 457-8313, Fax (519) 740-7091	
Project	
RUNNYMEDE LTC 625 RUNNYMEDE ROAD.	
TORONTO ONTARIO	
Drawing Title	
NOTES	
Drawn	J.S.
Scale	AS NOTED
Checked	D.S.
Date	SEPT, 2019
Project No.	R19-050
Drawing No.	SH1

TIEBACK SCHEDULE

Tieback No./Pile No.	Elevation	Angle (deg.)	Load (kN)	Tieback Diameter (mm)	Free Length (mm)	Bond Length (mm)	Approx. Total Anchor Length (mm)	Quantity
NORTH WALL								
NA42-NA45	116.60	20	350	150	4500	5000	9500	4
EAST WALL								
EA1-EA15	116.60	20	350	150	4500	5000	9500	15
SOUTH WALL								
SA1-SA28	116.25	25	350	150	4500	5000	9500	28
SA30-SA31	116.25	25	385	150	4500	5500	10000	2
WEST WALL								
WA1-WA13	116.25	20	350	150	5000	5500	10500	13
WA15-WA17	116.50	20	420	150	4500	6000	10500	3
WA20-WA23	116.50	20	420	150	4500	6000	10500	4



1 KEY PLAN
SH2 SCALE: 1:200

No.	Description	Date
5.	ISSUED FOR BUILDING PERMIT SUBMISSION	20/04/30
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100212210
PROVINCE OF ONTARIO

Client:
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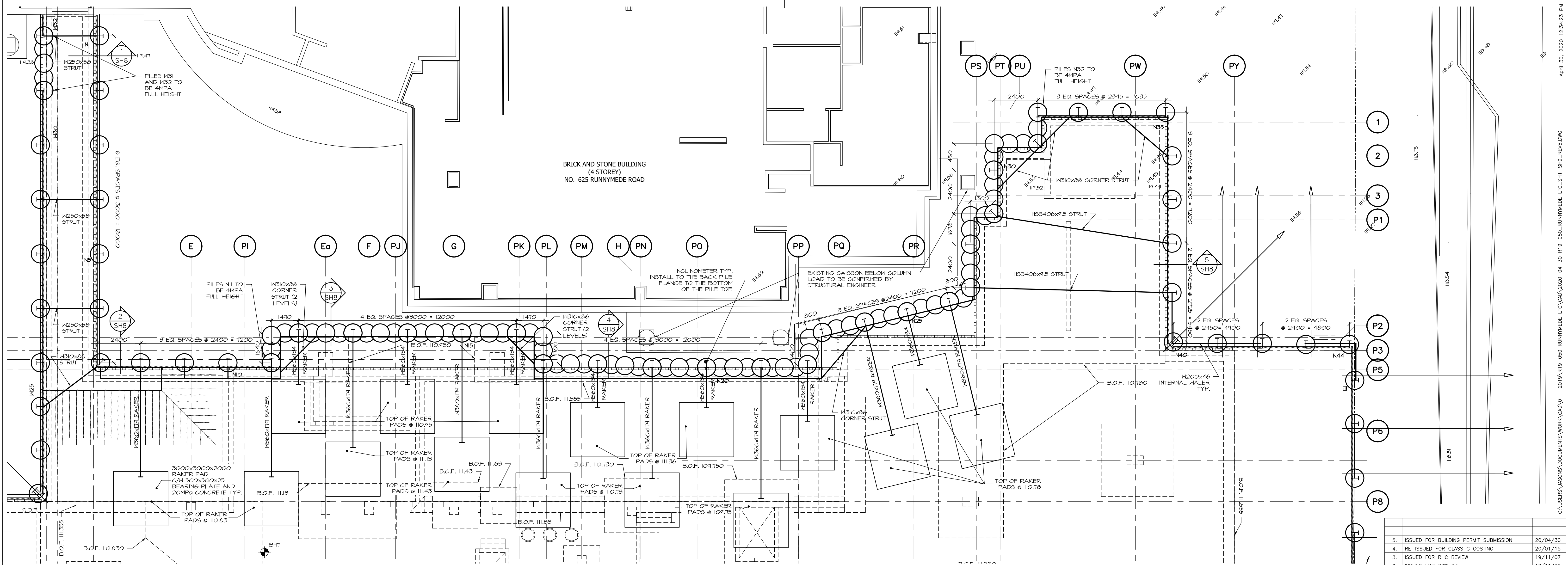
Consultant:
RWH
ENGINEERING INC.
138 Earl Thompson Road, Ayr, ON N0B1B0
Telephone (416) 457-8313, Fax (519) 740-7091

Project:
RUNNYMEDE LTC
625 RUNNYMEDE ROAD.

TORONTO ONTARIO

Drawing Title:
KEY PLAN

Drawn	J.S.	Scale	AS NOTED
Checked	D.S.	Date	SEPT. 2019
Project No.	R19-050	Drawing No.	SH2



NOTE:
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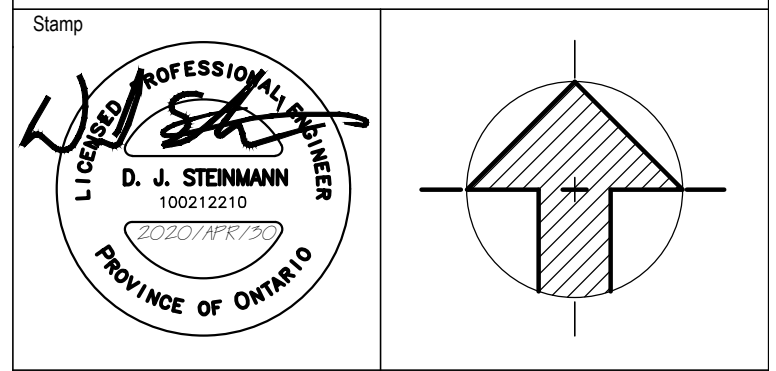
1 PLAN (NORTH WALL)
SH3 SCALE 1:100

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Project	
RUNNYMEDE LTC 625 RUNNYMEDE ROAD.	
TORONTO	ONTARIO
Drawing Title	
PLAN AND SECTIONS	
Drawn	J.S.
Scale	AS NOTED
Checked	D.S.
Date	SEPT. 2019
Project No.	R19-050
Drawing No.	SH3



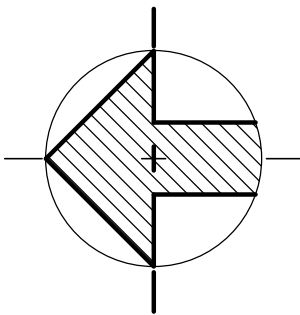
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0.	ISSUED FOR DISCUSSION	19/09/12
No.	Description	Date
R E V I S I O N		

Stamp

A circular professional engineer stamp from the Province of Ontario. The outer ring contains the text "PROFESSIONAL ENGINEER" at the top and "PROVINCE OF ONTARIO" at the bottom. In the center, the name "D. J. STEINMANN" is printed above the license number "100212210". Below the license number is an oval containing the expiration date "2020/04/15". A handwritten signature is scrawled across the top half of the stamp, and the word "Stamp" is written in the top left corner.



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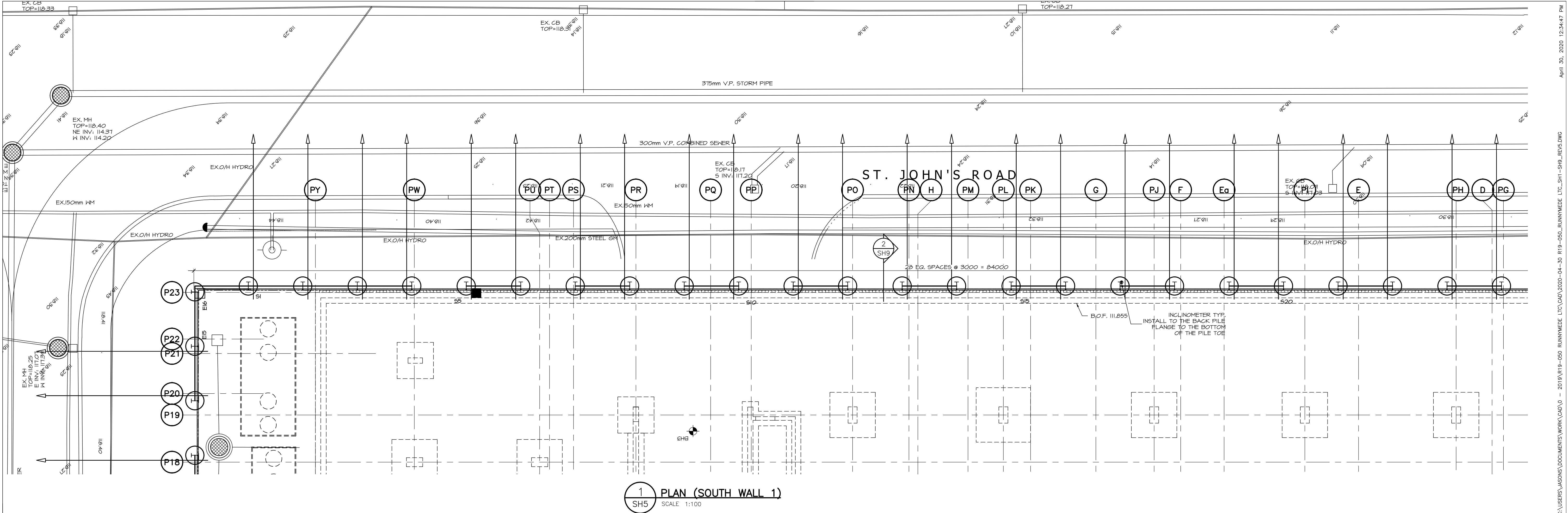
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625 RUNNYMEDE ROAD.

TORONTO ONTARIO

PLAN AND SECTION

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Project No.	R19-050	Drawing No.	SH4



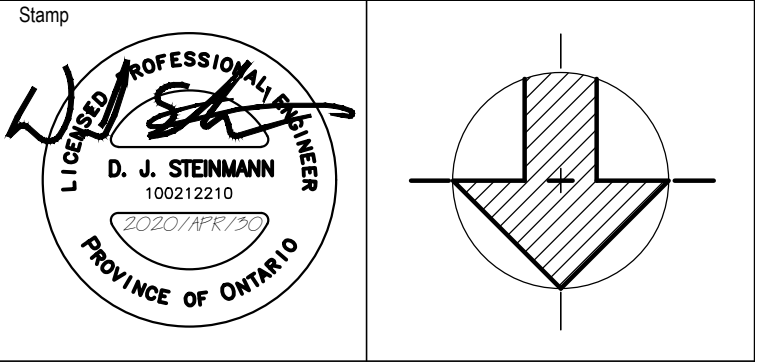
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Telephone (416) 457-8313, Fax (519) 740-7091

Project

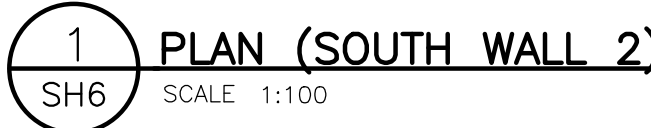
RUNNYMEDE LTC
625 RUNNYMEDE ROAD.

TORONTO ONTARIO

Drawing Title

PLAN AND SECTIONS

Drawn	J.S.	Scale	AS NOTED
Checked	D.S.	Date	SEPT, 2019
Project No.	R19-050	Drawing No.	SH5



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0.	ISSUED FOR DISCUSSION	19/09/12
No.	Description	Date

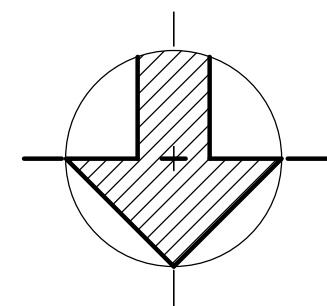
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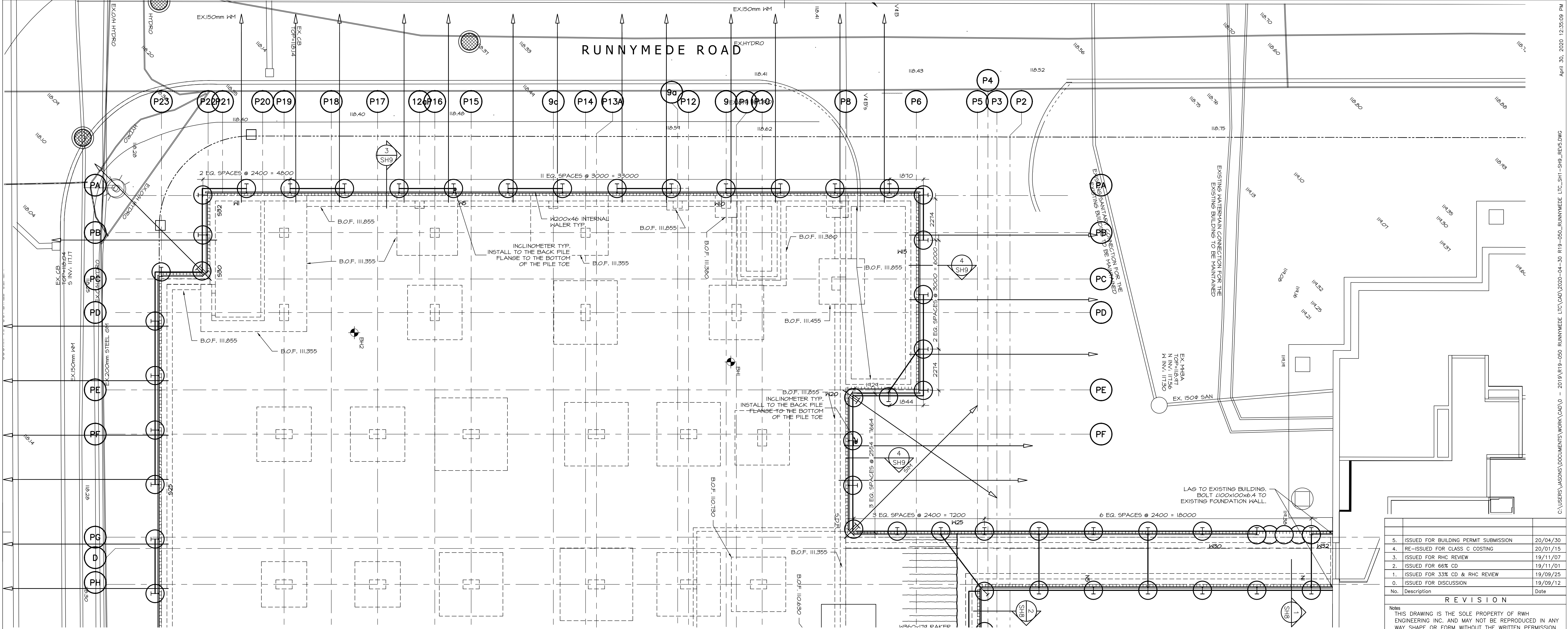
Project	
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RUNNYMEDE LTC
625 RUNNYMEDE ROAD.

TORONTO ONTARIO

PLAN AND SECTIONS

Drawn	J.S.	Scale	AS NOTED
Checked	D.S.	Date	SEPT. 2019
Project No.	R19-050	Drawing No.	SH6



NOTE:
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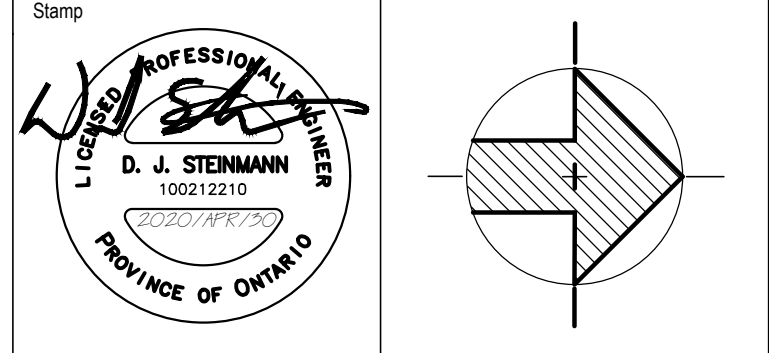
1 PLAN (WEST WALL)
SH7 SCALE 1:100

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REVISION

Notes
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Client
INNOVIA CORPORATION

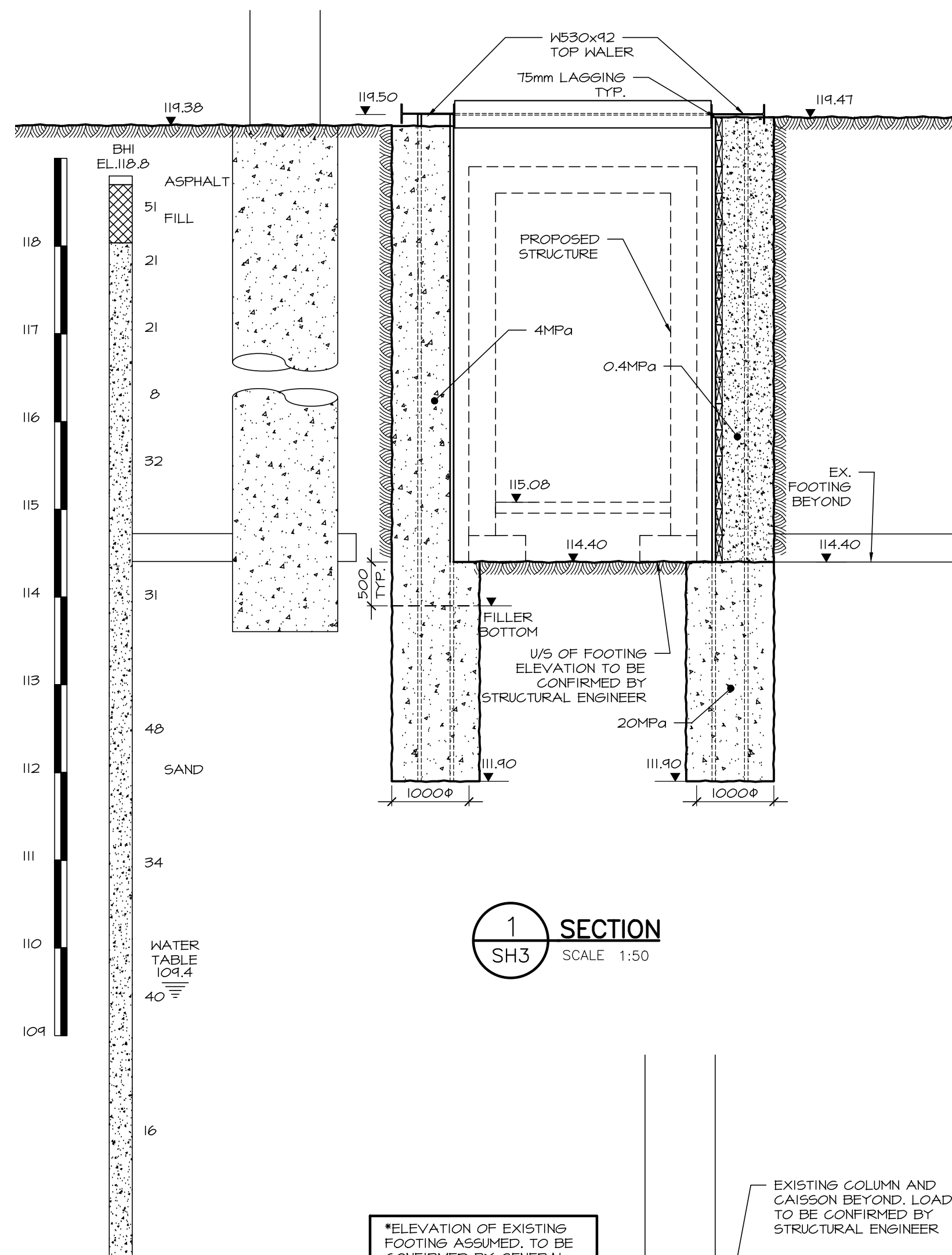
Consultant
RWH
ENGINEERING INC.
128 Earl Thompson Road, Ayr, ON N0B1E0
Telephone (416) 457-8313, Fax (519) 740-7091

Project
RUNNYMEDE LTC
625 RUNNYMEDE ROAD.

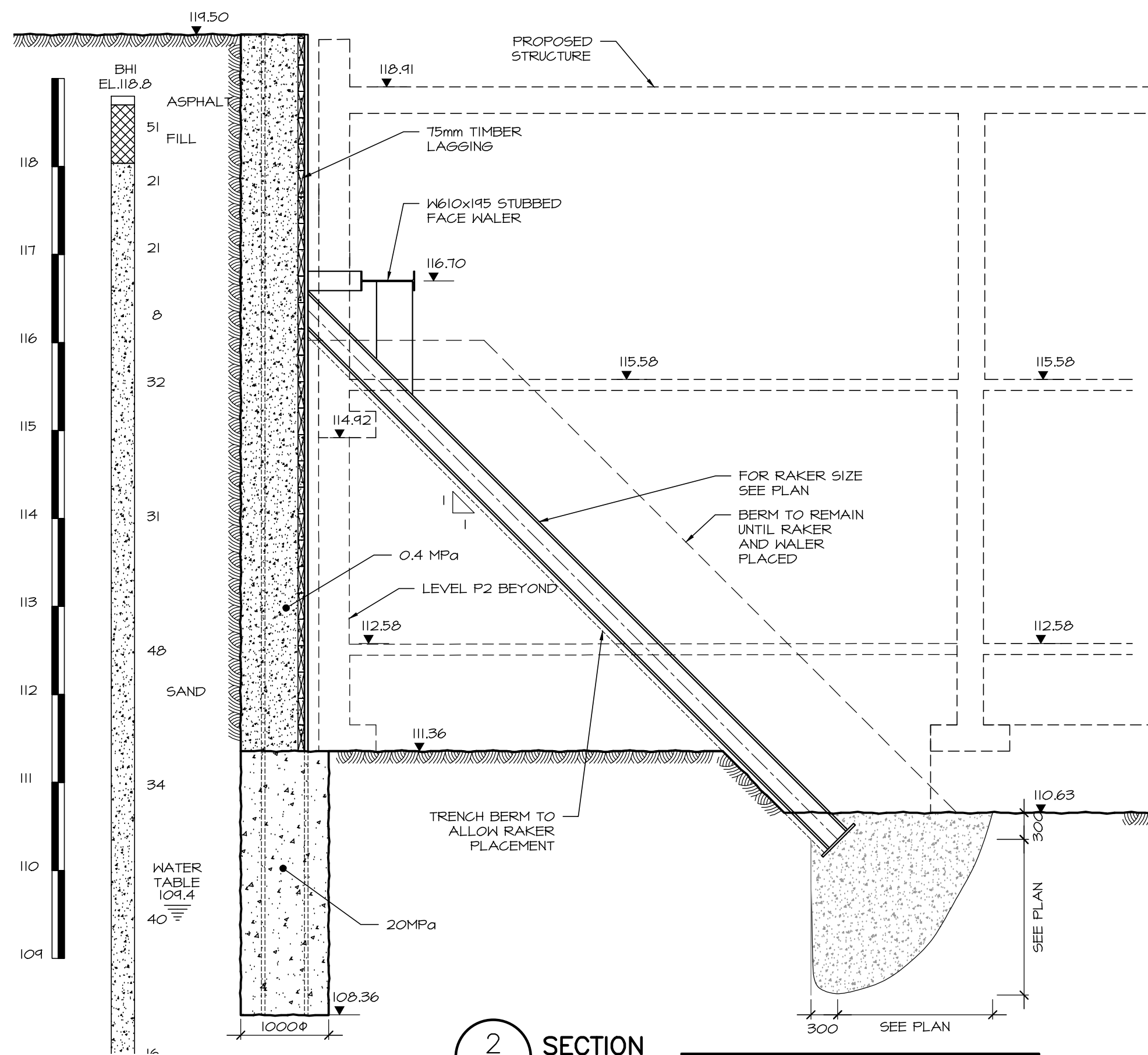
TORONTO ONTARIO

Drawing Title
PLAN AND SECTIONS

Drawn J.S.	Scale AS NOTED
Checked D.S.	Date SEPT. 2019
Project No. R19-050	Drawing No. SH7

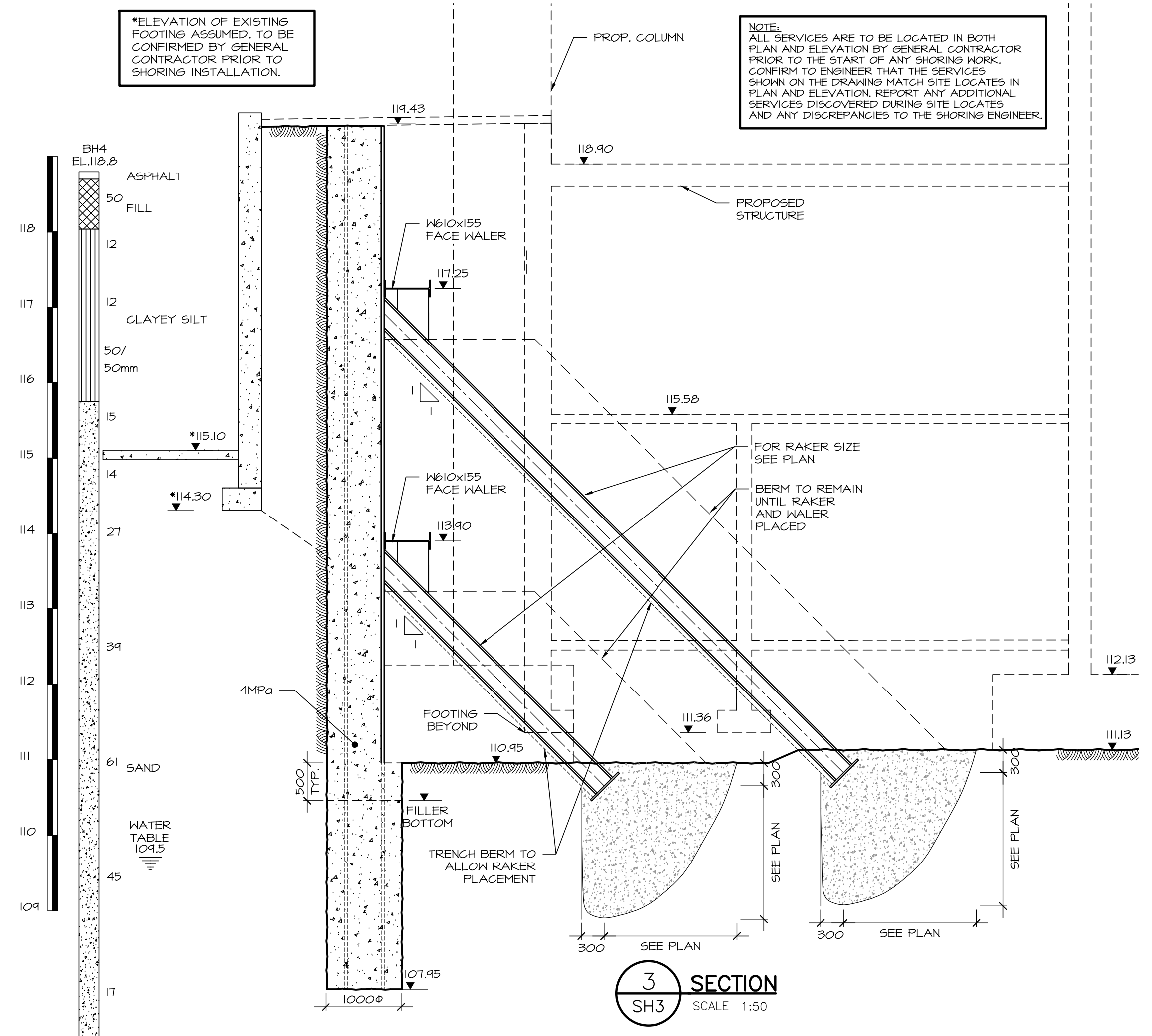


1 SECTION
SH3 SCALE 1:50

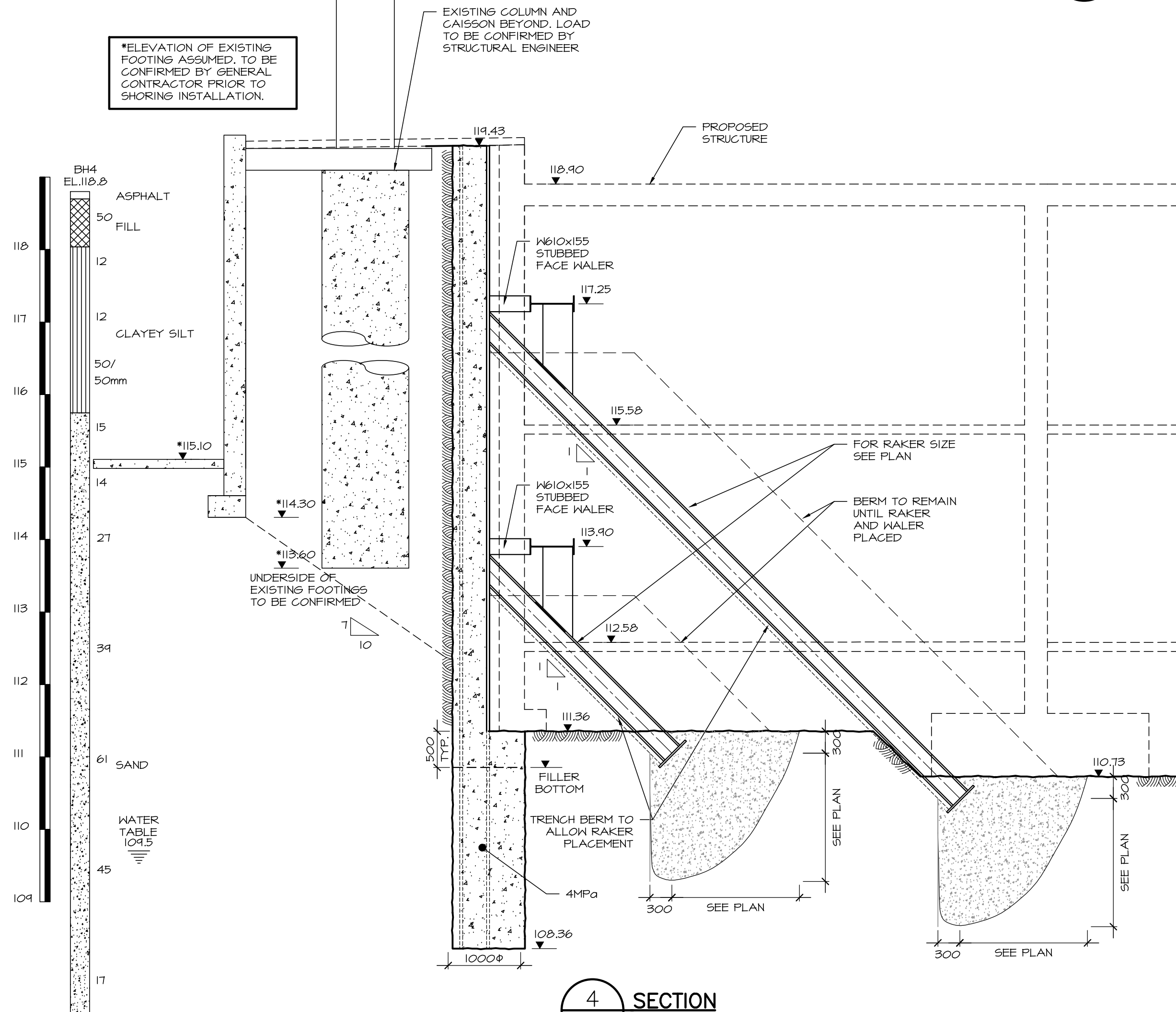


2 SECTION
SH3 SCALE 1:50

NOTE:
ALL SERVICES ARE TO BE LOCATED IN BOTH PLAN AND ELEVATION BY GENERAL CONTRACTOR PRIOR TO THE START OF ANY SHORING WORK. CONFIRM TO ENGINEER THAT THE SERVICES SHOWN ON THE DRAWING MATCH SITE LOCATES IN PLAN AND ELEVATION. REPORT ANY ADDITIONAL SERVICES DISCOVERED DURING SITE LOCATES AND ANY DISCREPANCIES TO THE SHORING ENGINEER.

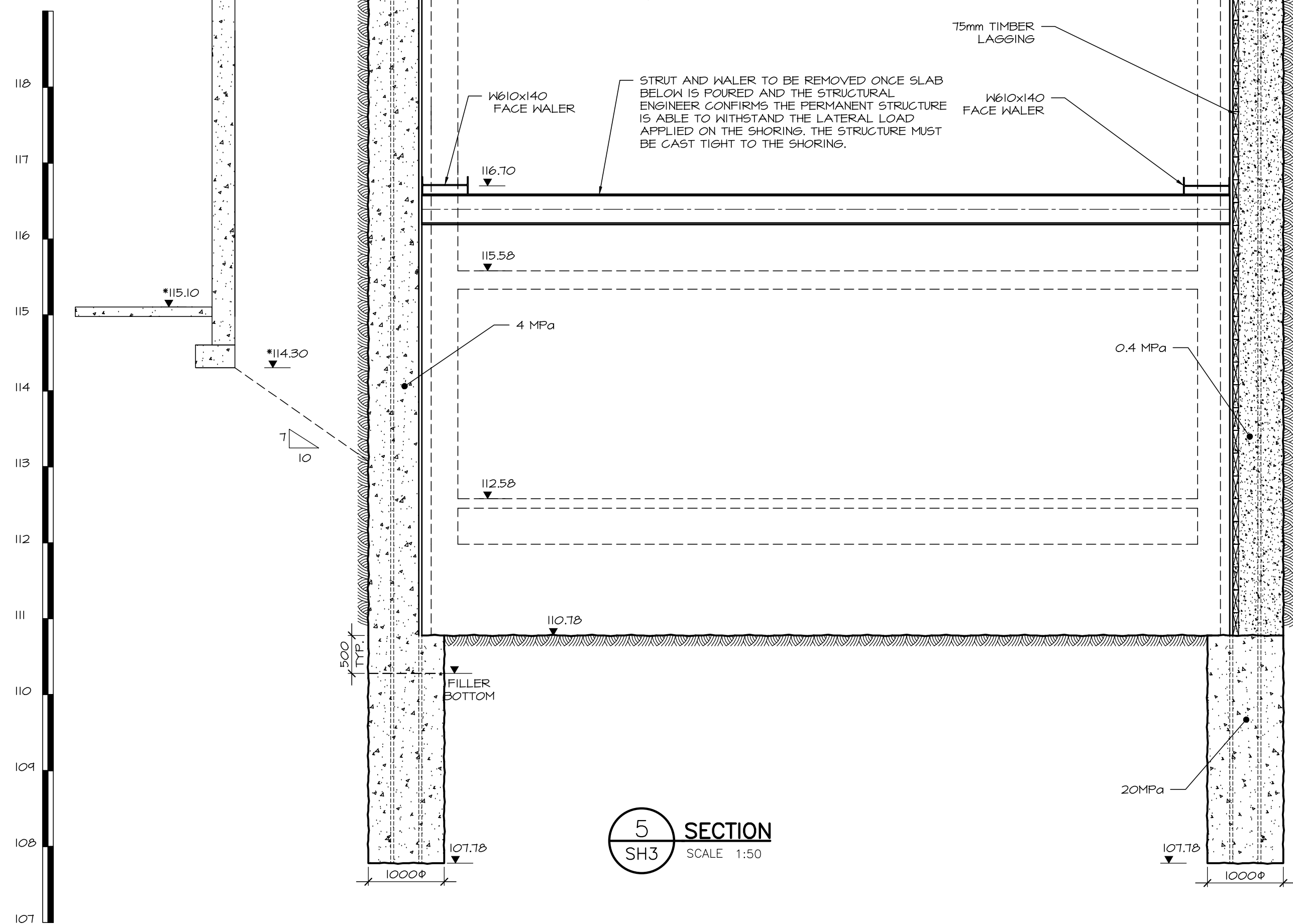


3 SECTION
SH3 SCALE 1:50



4 SECTION
SH3 SCALE 1:50

ELEVATION OF EXISTING FOOTING ASSUMED, TO BE CONFIRMED BY GENERAL CONTRACTOR PRIOR TO SHORING INSTALLATION.



5 SECTION
SH3 SCALE 1:50

5. ISSUED FOR BUILDING PERMIT SUBMISSION		20/04/30
4. RE-ISSUED FOR CLASS C COSTING		20/01/15
3. ISSUED FOR RHC REVIEW		19/11/07
2. ISSUED FOR 66% CD		19/11/01
1. ISSUED FOR 33% CD & RHC REVIEW		19/09/25
0. ISSUED FOR DISCUSSION		19/09/12
No.	Description	Date
REVISION		
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Stamp 		
Client INNOVIA CORPORATION		
Consultant 126 Earl Thompson Road, Ayr, ON N0B1B0 Telephone (416) 457-8313, Fax (519) 740-7091		
Project RUNNYMEDE LTC 625 RUNNYMEDE ROAD.		
TORONTO		ONTARIO
Drawing Title SECTIONS		
Drawn J.S.	Scale AS NOTED	
Checked D.S.	Date SEPT, 2019	
Project No. R19-050	Drawing No. SH8	

