RESIDENTIAL MIDRISE DEVELOPMENT
FUNCTIONAL SERVICING REPORT
390 ESSA ROAD – CITY OF BARRIE

Prepared by:

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17-11346B – rev. 0

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APPENDICES

1.0 INTRODUCTION

1.1 General

The proposed development is located at 390 Essa Road approximately 245m north of the Essa Road and Veterans Drive intersection. The site is approximately 0.35 hectares (0.86 acres) in area and is currently occupied by one (1) single-family residential home, two (2) sheds and one (1) barn. Access to the site is provided directly from Essa Road by two (2) asphalt driveways. The site is bounded by Essa Road to the west, a multi-unit commercial development to the south, and existing semi-detached residential dwellings to the east. The property is legally described as Part 1: Plan of Part of Part Lot 19 of Registered Plan 67 in the City of Barrie. The location of the subject site is further illustrated on Figure 1.

The owner of the property is proposing to construct a six-storey residential midrise building, consisting of 74 two bedroom units. Access to the development will be provided from Essa Road. Parking for the development will be provided via surface parking under the proposed building and south of the building. A reduced copy of the proposed site plan concept prepared by ACK Architects for the purposes of the rezoning application is included in Appendix A.

1.2 Purpose and Scope

Pinestone Engineering Ltd. (PEL) has been retained by the property owner to provide professional engineering services related to the preparation of a Functional Servicing Report (FSR). This report has been prepared to support a Rezoning Application for the subject lands. The purpose of this report is to describe the existing servicing infrastructure in the vicinity of the site, and provide recommendations for the provision of sanitary drainage, water distribution, and storm water management in accordance with City of Barrie criteria.

1.3 Reference Reports

The following reports and studies have been used for reference in the preparation of this Storm Water Management Report:

i) *City of Barrie Storm Drainage and Storm Water Management Policies and Design Guidelines, prepared by Valdor Engineering Inc., November 2009*

ii) *LSCRA Technical Guidelines for Storm Water Management Submissions, Effective Date: September 1, 2016*

iii) *City of Barrie Urban Design Manual, April 2007*

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390 ESSA ROAD

LOCATION PLAN

DATE:	SCALE:	PROJECT No.	FIGURE No.
AUG. 2018	N.T.S.	17-11346B	FIGURE 1

iv) *Lake Simcoe Protection Plan, June 2009*

v) *City of Barrie Sanitary Sewage Collection System Polices and Design Guideline, October 2017*

vi) *City of Barrie Water Transmission and Distribution Polices and Design Guidelines, May 2015.*

vii) *Ministry of the Environment Storm Water Management Planning and Design Manual, March 2003.*

viii) *Low Impact Development Manual prepared by Credit Valley Conservation and Toronto and Region Conservation, 2010*

ix) *City of Barrie Secondary Plan, Background Studies & Infrastructure Master Plans prepare by amec, October 2013*

2.0 SANITARY SERVICING

2.1 Existing Sanitary Servicing

A 250mm diameter sewer currently exists along the property frontage on Essa Road and conveys sewage northeasterly down Essa Road. The Essa Road sewer discharges to an existing 300mm diameter sewer located within a City owned easement at 368 Essa Road. From here, sewage is conveyed southerly towards Sunset Place and through an existing residential subdivision towards Harvie Road. Sewage on Harvie Road flows easterly and outlets to the Bayview Drive trunk flowing north.

The subject site is located within the Bayview sanitary drainage area and based on our review of the City of Barrie's Infrastructure Master Plan prepared by amec dated October 2013, no downstream surcharging of the existing infrastructure was noted in 2011. A copy of the sanitary mapping prepared by amec is included in Appendix B for further information.

2.2 Proposed Sanitary Flows

Contributing sanitary flows from the proposed development were calculated using City of Barrie design criteria as follows:

- A residential average sewage flow of 225 litres/capita/day
- A residential population density of 2.34 persons/unit for 2-bedroom units
- An extraneous flow rate of 0.1 litres/sec/ha
- A peaking factor based on Harmon's equation

With a total residential unit count of 74 units, the associated population to be serviced is 173 persons based on the above distribution. Incorporating extraneous flows, the combined

peak sewage flow generated by the proposed development is calculated to be 1.83 L/sec. Detailed sanitary calculations are included in Appendix B.

A review of the existing capacity of the immediate downstream reach of 250mm sanitary sewer along Essa Road was completed. The existing reach of sewer has a conveyance capacity of approximately 56 L/sec. The proposed peak sanitary flows from the development represents approximately 2.4% of the total capacity. We suggest that the City review the proposed design flow from this project with respect to the City's sanitary treatment capacities and confirm that capacity allocation is available for this development.

2.3 Proposed Sanitary Servicing

The proposed development will be serviced using a control manhole within the site boundary serviced from the existing Essa Road sanitary sewer by a 200mm service connection. Servicing details will conform to City of Barrie standards and the exact size and location of the service lateral will be determined during detailed design to the support the Site Plan Application.

A conceptual servicing layout is provided on the attached drawings included in Appendix F.

3.0 WATER SERVICING

3.1 Existing Water Servicing

A 200mm diameter watermain exists along the western side of Essa Road and is readily available to service the proposed development. The site is currently with a 25mm dia. water service to the existing home. This existing service will need to be decommissioned with the main stop being shut off at the watermain. For the zoning change, onsite pressures and flows have been confirmed to ensure there is sufficient capacity available for domestic and firefighting conditions. We have utilized information obtained from the municipal hydrants in the vicinity of the subject site connected to the existing 200mm diameter watermain on Essa Road. Table 1 illustrates the flow results of the testing conducted on Essa Road northeast of Veterans Drive by Vipond on April 11th, 2018.

Table 1
Results of Hydrant Flow Tests

Test #	Outlet Inside Dia. (in.)	Number of Outlets	Pitot Reading (PSI)	Flow@ Residual (gal/min)
1	n/a	n/a	53 (static)	n/a
2	2.50	1	50	1034
3	2.50	2	49	1644

Refer to Appendix C for the flow testing information obtained by Vipond Inc.

3.2 Proposed Water Demands

A per City standards, the domestic water demand for the building is listed in Table 2 below:

Table 2
Domestic Water Demand

Population	Per Capita Flow (L/day)	Peaking Factors (based on MOECC Guidelines)		Flows (L/sec)	
		Peak Hour	Maximum Day	Peak Hour	Maximum Day
173	225	2.25	1.3	1.01	0.59

Fire demands for the proposed development were calculated in accordance with the Fire Underwriters Survey (FUS) as follows:

$$F = 220C(A)^{0.5}$$

Where,

F = the required fire flow in litres per minute.
C = coefficient related to the type of construction.
A = total floor area of building (excluding basements)

Table 3: Water Requirements for Fire Fighting

Total Area (sq.m)	Coefficient "C"	Required Flow (L/min)	Require Flow (L/sec)
7,536	0.6	11,500	192

Based on the guidance provided in the FUS and applying the relevant reductions and charges in flow for construction type, sprinkler systems and exposure distances, the required fire flow for the development can be reduced to 126 L/sec. Detailed FUS calculations are provided in Appendix C.

Using the information provided from the flow test completed by Vipond, the following flow volume can be supplied from Essa Road while maintaining a residual pressure of 140 kPa (20 psi) in the distribution system. The calculation is based on information provided within the City of Barrie's Water Transmission and Distribution Policies and Design Guidelines.

$$QA = QT * (ha/ht)^{0.5}$$

Where, QA = Flow at 20 psi
QT = Flow at test
Ha = pressure drop available
Ht = pressure drop at test

Therefore, the following supply is available:

$$QA = 1644 * ((53-20)/(53-49))^{0.5}$$
$$QA = 4722 \text{ gpm } (298 \text{ L/sec})$$

Based on the hydrant flow test information, adequate domestic and fire flows are available to service the development.

3.3 Proposed Water Servicing

The proposed development will be serviced by a 100mm diameter domestic service connection and 150mm fire service connection from the existing 200mm diameter watermain located on Essa Road. Further requirements for domestic and fire lines will be assessed at the detailed design stage. Servicing details will conform to City of Barrie standards and the exact size and location of the water services will be determined during detailed design to the support the Site Plan Application.

It is estimated that the ground floor pressure will be reduced by approximately 35 kPa (5 psi) per floor. On the sixth floor, pressures are expected to be approximately 140 kPa (20 psi) and therefore, it is anticipated internal boosting pumps will be required to ensure adequate domestic and fire pressures exists on the upper flows.

A conceptual servicing layout is provided on the drawings included in Appendix F.

4.0 STORM DRAINAGE

4.1 Existing Storm Drainage & Topography

A 375mm diameter storm sewer exists along the frontage of the subject site on Essa Road and conveys drainage north easterly before heading west through Meadow Lane, Wildwood Trail and Snowshoe Trail. Drainage from the storm sewer system outlets to the Snowshoe Park storm water management facility (City Pond BR-13).

Based on a review of the topographic survey provided by A. Aziz Surveyors, the property is relatively flat and slopes gently from a centralized high point to the north towards Essa Road and to the east towards the existing semidetached residences. Elevations across the site range between 311.98m ASL at the southern limit of the site to 310.64m ASL at the northwest corner. Runoff from the site currently drains in the form of overland sheet flow. No storm water quantity or quality control measures currently existing on the property.

The site is not located within a Lake Simcoe Regional Conservation Authority (LSRC) regulated area based on available mapping on their website.

4.2 Site Geology

A geotechnical investigation for the subject property was completed by Peto MacCallum Ltd. The field work was conducted on April 6th, 2018 and consisted of 4 boreholes advancing to a maximum depth of 6.7m. The geotechnical findings are summarized below:

- Below the topsoil or surface granular, a fill unit composed of sand with variable silt content, trace gravel and local trace organics was noted in all four boreholes, carrying to 1.4 to 2.1 m depth (elevation 309.3 to 310.1). The layer was moist with a water content of 5 to 19%.

- Underlying the fill, a native silty sand deposit was encountered in Boreholes 1, 3 and 4 to 2.2 to 4.0 m depth (elevation 307.4 to 308.9). The unit contained trace gravel. The layer was compact to dense (N Values 14 to 41) and was moist to very moist with moisture contents of 9 to 20%.

- Beneath the native silty sand deposit, a clayey silt layer was encountered in Boreholes 1, 3 and 4 to 4.0 to 5.5 m depth (elevation 306.0 to 307.1). Atterberg Limits testing on one sample showed the material to have a plastic limit of 16% and a liquid limit of 20%. The material was very stiff to hard (N Values of 18 to 45 blows). The clayey silt was typically drier than the plastic limit, with moisture contents ranging from 8 to 19%.

- The stabilized ground water level is considered to be below 6.7 m depth at the time of the geotechnical investigation. Localized areas of perched water across the site are possible, especially above the till and/or clayey silt.

Based on our review of the soils information provided by Peto MacCallum Ltd. we have classified the site material as a Type CD under the Soil Conservation Service, hydrologic soil group as outlined in the *MTO Drainage Manual Volume 3, Design Chart 1.08*.

An assessment on the suitability of the native soils for the purpose of infiltration and implementation of low impact development controls (LID) was also completed by Peto MacCallum Ltd. They note that in general, the silty sand has some infiltration capacity, however, the clayey silt and sand and silt till that underlie the silty sand have little to no infiltration capacity. As such, infiltration facilities are less favourable in areas in which the less pervious soils are encountered at higher elevations (Boreholes 2 and 4 at the north side of the site). The ground water table was generally not encountered during this assignment, however local perched water may exist.

As a result of this assessment, we do not recommend infiltration on this site. An excerpt from the geotechnical investigation prepared by Peto MacCallum Ltd. is included in Appendix D.

4.3 Design Criteria

Quantity Control:

- Peak flow attenuation for the 2-year through 100-year storm events to pre-development rates based on the Rational Method using the City of Barrie's IDF parameters.

- Maintain existing drainage patterns, ensuring adjacent properties are not adversely affected.

Quality Control:

- Water quality enhancement to an "enhanced" level of protection or 80% total suspended solids removal (TSS).

- Preparation of detailed erosion, sediment control and construction mitigation plan to be implemented as part of the construction program.

Water Balance:

- Sites ≤ 5 ha (e.g. site plans or infill sites) shall minimize any anticipated changes in the water balance between pre-development and post-development conditions and shall provide a minimum infiltration equivalent to the first 5 mm of any given rainfall event.

Phosphorus Mitigation:

- Evaluation of anticipated changes in phosphorus loadings between pre-development and post-development. Phosphorus offsetting requirements per LSRCA policy is required for this development.

4.4 Pre and Post Development Flow Rates

We have selected the 2-yr through 100-yr design storms as part of our evaluation. Peak flows were calculated using the Rational Method as recommended in the City of Barrie's SWM Guidelines. In order to determine the peak flows generated from the site, one (1) pre-development and three (3) post development catchments were delineated using the catchment parameters listed in Table 4.

Table 4
Sub-catchment Parameters

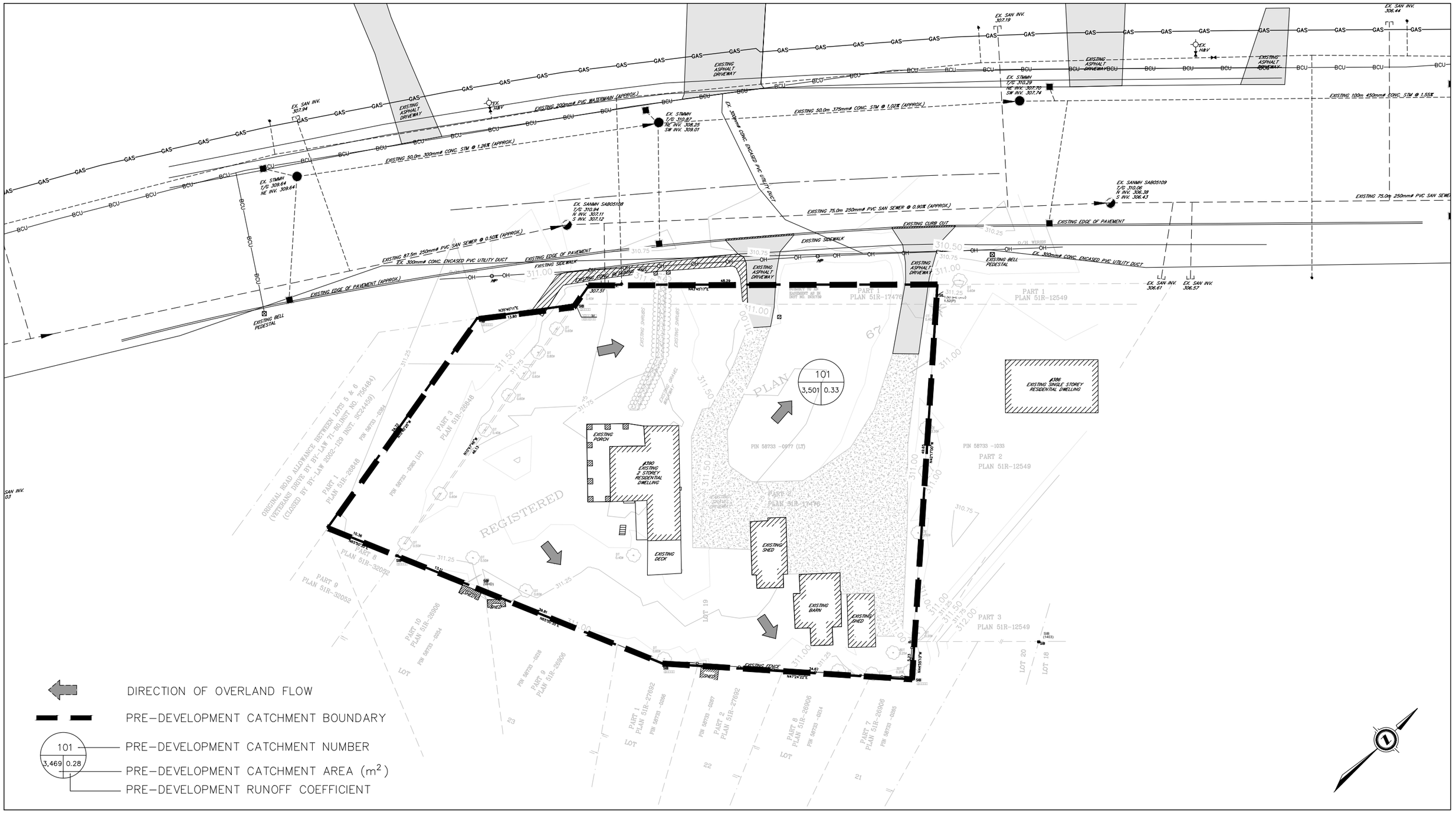
Catchments	Area (m^2)	Slope (%)	Composite Runoff Coefficient "C"
Pre-Development			
101	3501	1.0	0.33
Post Development			
201 (Building Roof Top)	1240	1.5	0.95
202 (Parking Lot)	1134	2.0	0.95
203 (Landscape)	1127	4.0	0.24

Pre-development and post development catchment areas are illustrated on Figures 2 and 3 respectively. The results from the 2 through 100-year peak storm events are listed in Table 5 below.

Table 5
Rational Method – Peak Flows

	2Yr	5Yr	10Yr	25Yr	50Yr	100Yr
Pre-Development (m^3/sec)						
Catchment 101	0.026	0.035	0.040	0.052	0.063	0.072
Total Pre-Development	0.026	0.035	0.040	0.052	0.063	0.072
Post Development (m^3/sec)						
Catchment 201 (Building Roof Top)	0.027	0.036	0.041	0.051	0.057	0.062
Catchment 202 (Parking Lot)	0.025	0.033	0.038	0.047	0.052	0.057
Catchment 203 (Landscape)	0.006	0.008	0.009	0.012	0.015	0.017
Total Post Development	0.058	0.076	0.089	0.110	0.123	0.136

Based on the calculated results using the Rational Method, post development flows will increase as a result of the proposed development and construction and increased site imperviousness. Rational Method design calculations are included in Appendix D.



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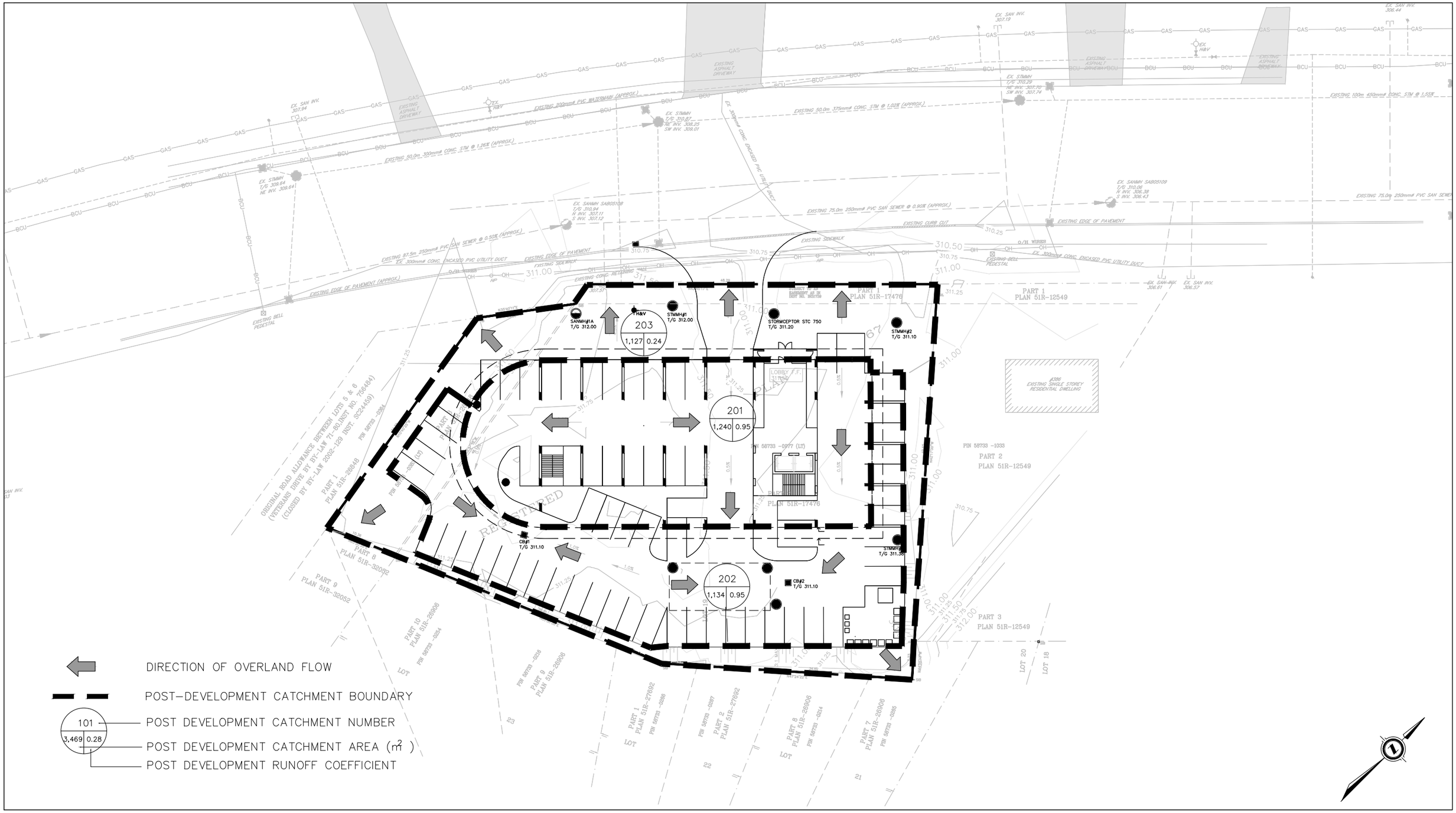
390 ESSA ROAD
MIDRISE DEVELOPMENT

PRE DEVELOPMENT CATCHMENT PLAN

PROJECT NO. 17-11346B

SCALE: 1:500 | DATE: AUGUST 2018

FIGURE 2



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390 ESSA ROAD
MIDRISE DEVELOPMENT

POST DEVELOPMENT CATCHMENT PLAN

PROJECT NO. 17-11346B

SCALE: 1:500

DATE: AUGUST 2018

FIGURE 3

4.5 Quantity Control

The proposed drainage from the building rooftop (Catchment 201) will flow via gravity through a 200mm diameter roof leader to an underground ADS StormTech storage chamber proposed at the rear of the building. Drainage from the uncovered parking area (Catchment 202) at the rear of the building will be directed to a series of catch basins and conveyed to the underground storage system. Drainage from Catchment 203, the uncontrolled landscape areas surrounding the site will continue to flow offsite via overland sheet flow similar to pre-development conditions.

To provide attenuation of post development flows, approximately 63m^3 of storage is required for the 100-year event. The required storage volume will be provided by utilizing rooftop storage and StormTech inground storage chambers. Using Zurn 105 flow control roof drains (or approved equivalent), at a maximum head of 125mm, the peak flow through the 3 roof drains is 9.3/sec. Approximately 30m^3 of storage will be utilized on the building rooftop and 36m^3 of storage will be provided within the underground StormTech system to provide the necessary peak flow attenuation volume.

Peak discharge rates from the underground storage chambers will be released at a controlled rate to match pre-development levels using an orifice restriction installed within STMMH#2 located in the north corner of the property. STMMH#2 will also be equipped with an open grate at elevation 311.10m to allow major overland flows to surcharge through the grate opening and discharge to the Essa Road right of way.

Detailed stage storage calculations and orifice sizing calculations will be provided at the Site Plan Approval stage. Preliminary volume calculations using the Modified Rational Method are included in Appendix D.

4.6 Quality Control

The primary objective of the storm water management plan for this development will be to maintain acceptable water quality within the receiving storm sewer and ultimate outfall, Lake Simcoe by maintaining existing site drainage patterns and flow rates. In order to provide water quality enhancement to an “enhanced” level of protection (80% TSS removal) for this development a preliminary review of a “treatment train” approach was completed. The following summarizes potential quality control devices that may be incorporated into the detailed SWM design.

- Provision of “soft” landscaping where feasible.
- Maintenance of existing vegetation where feasible.
- Yard grading using minimal surface slopes where possible to promote infiltration and mitigate erosion.
- The installation of Stormceptor STC 750
- Suitable construction mitigation measures to be utilized during the site development.

The potential treatment alternatives have been evaluated with respect to their applicability for this development and implemented in a manner to achieve the best total suspended solids (TSS) removal possible. Table 6 summarizes the proposed measures that in

conglomeration will provide an overall TSS removal of greater than or equal to 80% which meets or exceeds the criteria outlined.

Table 6
Proposed Approach for Water Quality Treatment

Surface	Method	Effective TSS	Area (m2)	% Area of Site	Overall TSS Removal %
Asphalt Parking Area and building area (Catchment 201 & 202)	Stormceptor STC 750 OGS Unit	86%	2374	68%	59
Landscape and existing vegetation (Catchment 203)	Filtration / Evapotranspiration	80%	1127	32%	26
Total			**3,501**	**100**	**85**

Sizing calculations and a preliminary design report for the proposed Stormceptor unit are included in Appendix D. Detailed calculations for quality control devices will be provided through the Site Plan Approval process.

4.7 Water Budget

As per City policy 4.1.3 of the Storm Water Policy and Design Guidelines, sites less than 5 ha shall minimize any anticipated changes in the water balance between pre-development and post development conditions and shall provide a minimum infiltration equivalent to the first 5mm of rainfall. Based on a total site area of 3501m^2, the first 5mm of rainfall to be retained on the site for infiltration equates to 17.5m^3. Initial abstraction values provided in the City's SWM guidelines on Table 7 are as follows:

Table 7
Initial Abstraction Values

Cover	Initial Abstraction / Depression Storage (mm)
Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious areas	3

Adapted from UNESCO, Manual on Drainage in Urbanized Areas, 1987

Using the values provided in the Table 7 above, approximately 12.5m^3 of rainfall will be retained on the site through initial abstraction. As previously stated, the existing soil conditions are not conducive for infiltration of storm water. To retain the shortfall of 5m3 onsite, a holding tank could be provided between the building roof drain connection and underground storage system. The holding tank could be connected to the irrigation system where storm water would then be used to irrigate landscape areas. This will be further

evaluated at the Site Plan Approval stage.

4.8 Phosphorus Mitigation

As part of the Lake Simcoe Protection Plan, all new developments must be accompanied with an evaluation of anticipated changes in phosphorus loadings between pre-development and post-development.

The MOE's P-Tool was utilized to determine pre and post development phosphorus loadings. Low intensity area was used in modelling the phosphorus loadings from the site for the pre-development condition. For the post development condition, high intensity residential development was used to estimate phosphorus loadings. In the pre-development condition phosphorus loadings were calculated at 0.05 kg/year and in the post development condition, 0.46kg/year. Phosphorus budget calculations are included in Appendix D.

LSPOP (Lake Simcoe Phosphorus Off-Setting Policy) requires that all new development must control 100% of the phosphorus from leaving their property. This is referred to as the Zero Export Target, a key component of the LSPOP that ensures new development or redevelopment activities do not continue to contribute to phosphorus loading to Lake Simcoe.

The proposed approach to mitigate the impacts of phosphorus include:

- Installation of an underground storage system to provide attenuation of peak flows and reduce phosphorus levels.
- Installation of a perforated drain system under the storage chambers complete with a sand filter / Sorbtive media.
- Installation of goss traps or CB shields within catch basins to collect and trap larger particles.
- Maintenance of existing vegetation around the perimeter of the site.

If 100% mitigation cannot be achieved due to site constraints discovered at the site plan approval stage, the developer will be required to pay cash in lieu to the LSRCA in accordance with the LSPOP. Technical details related to the proposed phosphorus mitigation facilities will be provided at the Site Plan Approval stage.

4.9 Erosion and Sediment Control

Sedimentation and erosion control measures are required during construction and until such a time that site development has been completed and the driveway and parking area has been resurfaced.

The use of various siltation control measures will be implemented to protect the adjacent

properties and receiving waterbodies from migrating sediments. These works include but may not be limited to:

- Installation of siltation fencing along perimeter of the development area.
- Filter cloth / silt sack placement over drains.
- Installation of vehicle tracking mud mats at the entrance to the site.

Sediment and erosion controls devices will be detailed at the Site Plan stage once the site plan has been finalized.

5.0 UTILITIES

Correspondence was received from both Enbridge Gas and Alectra Utilities confirming the proposed development can be serviced from existing infrastructure on Essa Road.

Correspondence with the utility agencies is included in Appendix E.

6.0 CONCLUSION

Based on the above findings, the proposed development can be serviced utilizing the existing surrounding infrastructure on Essa Road. The proposed servicing for the development can be achieved without any adverse impact to the existing municipal services along Essa Road.

We trust this is satisfactory and should you have any questions, please call.

All of which is respectfully submitted by,

PINESTONE ENGINEERING LTD.

Joe Voisin, P.Eng.
Senior Engineer, Partner

APPENDIX A

Proposed Site Plan Concept

PINESTONE ENGINEERING LTD.

ESSA ROAD

WIDENED BY INST. NO. 20004,MTO PLAN P-2054-9

(FORMERLY THE KING'S HIGHWAY NO.27)

PIN 58733-0237 (LT)

CENTER LINE OF PAVEMENT

CENTRELINE 17.00m [55'-9½"]

R8.00m [R26'-3"]

EXIST. CURB CUT

SIDEWALK

O/H WIRES

HP

BELL PEDESTAL

PART 1 :
PLAN OF PART OF PARKLOT 19
REGISTERED PLAN 67

PART 1
PLAN 51R-17476

PART 1
PLAN 51R-12549

SUBJECT TO AN EASEMENT AS IN INST NO. IN31739

SIB (1403) 1.50 S-E (MS) 1.52(P)

SIB (1546) 3.34S(M) 3.37(P2)

IB (1546)

9.00m [29'-6⅝"]

1.50m [4'-11"]

LANDSCAPE 3.00m [9'-10"]

FRONT YARD 6.19m [20'-3⅜"]

ELECT CHARGE

1 2BF

3.12m [10'-2½"]

FRONT YARD 6.95m [22'-9⅝"]

SIDEYARD 6.32m [20'-9"]

40 50

5.50m [18'-0⅝"]

2.70m [8'-10⅝"]

6.40m [21'-0"]

1.94m [6'-4⅜"]

LOBBY

2.70m [8'-10⅝"]

3.85m [12'-7⅝"]

SIDEYARD 8.33m [27'-3⅝"]

3.70m [12'-1⅝"]

3.65m [12'-7⅝"]

3BF

VISITOR

REGISTERED PLAN 67

2.85m [9'-4"]

39

5.58m [18'-3⅝"]

2.70m [8'-10⅝"]

6.40m [21'-0"]

57 56 51

M/E ROOM

2.70m [8'-10⅝"]

5.50m [18'-0⅝"]

6.55m [21'-5⅝"]

PET WASHING STATION

PART 2
PLAN 51R-17476
PIN 58733 -0977 (LT)

58 63 65

61 62 64

5.50m [18'-0⅝"]

LINE OF BLDG ABOVE

LINE OF BALCONY ABOVE

SIDE YARD 6.73m [22'-0¼"]

PART 1 PLAN 51R-26848

PART 3 PLAN 51R-26848 PIN 58733 -0383 (LT)

PIN 58733 -0364

SNOW STORAGE

34 35

REARYARD 10.55m [34'-7⅛"]

SIB (1403)

SIB (MHD)

PART 8 PLAN 51R-32052

PART 9 PLAN 51R-32052

18.96m [62'-2⅛"] REARYARD

6.49m [21'-0"]

12

8 CUBIC YARD GARBAGE

1.50m [4'-11"]

LOT 19

22 21 13

2.70m [8'-10⅝"]

1.50m [4'-11"]

2.51m [8'-3"]

3.55m [11'-7⅝"]

390L ORGANICS

95G RECYCLE

IB (1403)

SIB (1255)

PART 10 PLAN 51R-26906

PIN 58733 -0254

PIN 58733 -0216

PART 9 PLAN 51R-26906

LOT

PART 3
PLAN 51R-12549

SIB (1403)

LOT 20

LOT 18

ZONING TABLE			
PROVISION	REQUIRED R1 (current zone)	REQUIRED RA2 (proposed zone)	PROVIDED
Lot Area	900SM (min)	1,300SM (min)	3,501.3SM (.87ac)
Developable Area	-	-	3,367SM (.83ac)
Lot Frontage	22M (min)	30M (min)	68.4M
Setbacks			
Front Yard	4.5M (min)	7M (min)	
Interior Side Yard	1.2M (min)	5M (min) 7M (min) with ped. access	
Rear Yard	7M (min)	7M (min)	
Landscaped Open Space	n/a	35% (min)	
Landscaped Buffer	3M	3M	
Dwelling Unit Floor Area	110SM (min)	45m2 / 1bdrm 55m2 / 2bdrm	
Lot Coverage	45%	35%	
Gross Floor Area	n/a	200% of lot area (max)	
Building Height	10M (max)	30M (max)	
Parking Spaces	113 (1.5/u min)	113 (1.5/u min)	
Number of Units	n/a	n/a	
Density	12-25 u/ha	54 u/ha (min)	

GENERAL NOTES:

All contractors and/or trades shall verify all dimensions, notes, site and report any discrepancies prior to commencement of the work. This drawing is not to be scaled, all drawings, prints and related documents are the property of the architect and must be returned upon request. Reproduction of drawings and related documents in part or in whole is strictly forbidden without written consent. Drawings to be for the purpose for which they are issued.

NO.	DATE:	REVISION:	BY:
1	DEC7-2017	CLIENT REVIEW	KK
2	APRIL27-2018	CLIENT REVIEW	KK
3	MAY29-2018	ZBA	KK

COMMISSION:

PROPOSED:
MID-RISE
RESIDENTIAL

390 ESSA ROAD, BARRIE, ON

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F.416.492.1954
toronto, ontario
m4a 1b3

SHEET TITLE:

SITE PLAN

Issued for Re-Zoning:	
Issued for Site Plan Agreement:	
Issued for Permit:	
Issued for Tender:	
Issued for Construction:	
DRAWN BY:	KK
CHECKED BY:	DC
DATE:	DEC7-2017
SCALE:	1:100
PROJECT No.:	2017-184

DWG No. SP of A_

APPENDIX B

Sanitary Servicing Calculations

PINESTONE ENGINEERING LTD.

390 Essa Road

City of Barrie

SANITARY SEWER DESIGN SHEET

ENGINEERING AND PUBLIC WORKS

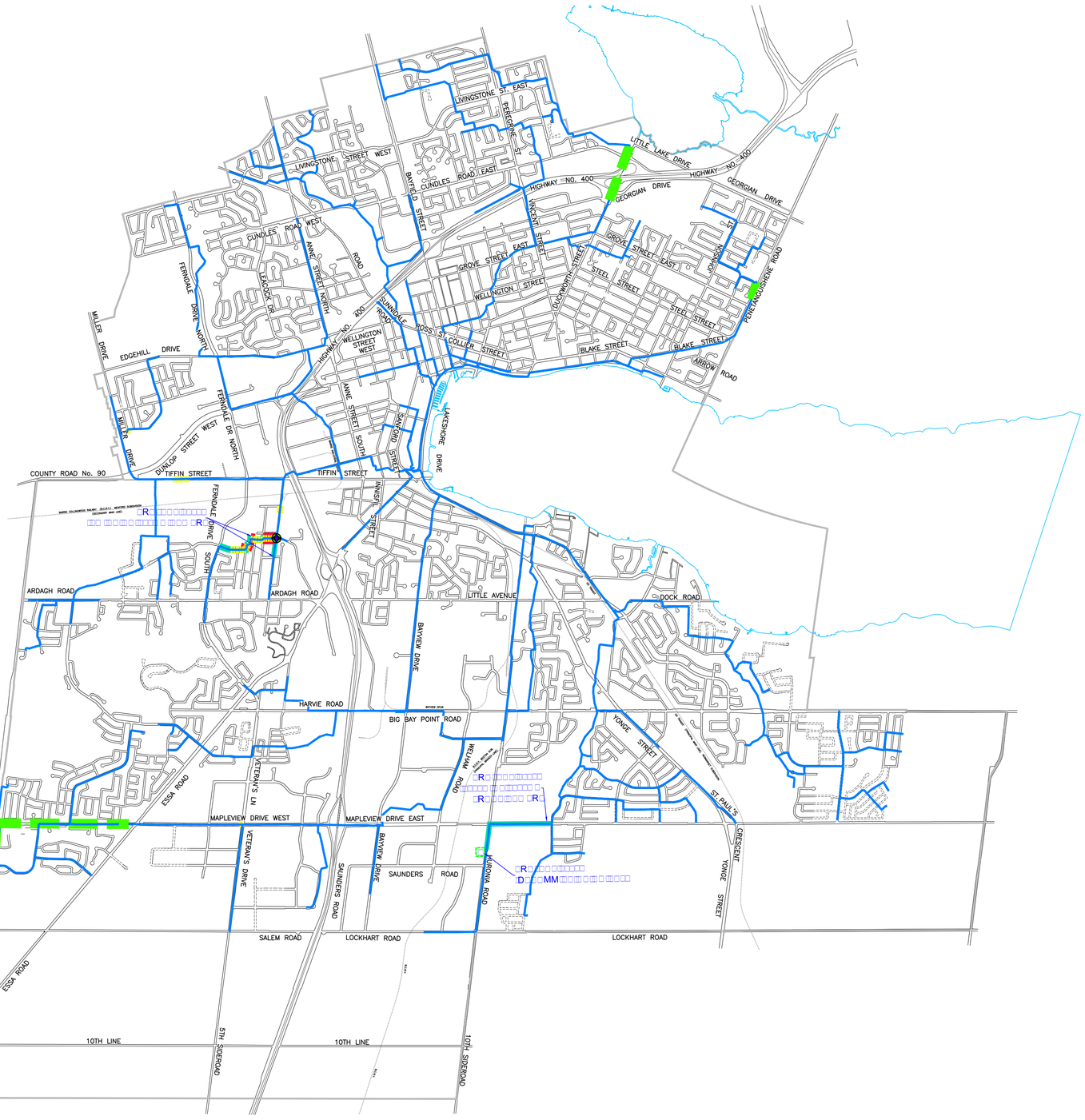
Project Number: 17-11346B
Date: April, 2018
Design By: LPB
Checked By: JHV
Drainage Area Plan No: N/A
File: Z:\Project Documents\11346B 390 Essa Road FSR\FSR\Servicing Calculations\Sanitary Sewer Design Sheet.xls

Design Parameters

Average Daily Flow
Residential 0.0026 L/s/c
Commercial 0.326 L/s/ha
Mannings "*n*" 0.0130
Min. Velocity 0.75 m/sec
Max. Velocity 3.0 m/sec
Residential Harmon Peaking Factor (F)
Infiltration 0.10 L/s/ha

PEL PINESTONE ENGINEERING LTD.

LOCATION				RESIDENTIAL AREAS and POPULATION						SCHOOL, INSTITUTIONAL			COMMERCIAL			INDUSTRIAL				INFILTRATION			DESIGN							
										HECTARES AND FLOW OF EACH ZONING																			
										0.00 *L/s/ha*			0.326 *L/s/ha*			0.00 *L/s/ha*													
STREET	AREA NO.	MANHOLE LOCATION FROM MH	MANHOLE LOCATION TO MH	AREA	UNITS	POPUL.	CUMUL POPUL.	PEAK FACTOR "F"	PEAK RES. FLOW	AREA	CUMUL AREA	PEAK FLOW	AREA	CUMUL AREA	PEAK FLOW	AREA	CUMUL AREA	PEAK FLOW	TOTALS-C-I FLOW	AREA	CUMUL AREA	INFIL FLOW	TOTAL VOLUME FLOW	LENGTH	SLOPE	PIPE SIZE	CAPACITY	FULL FLOW VELOCITY	ACTUAL VELOCITY
				ha		*1000s*	*1000s*		*L/sec*	*ha*	*ha*	*L/sec*	*ha*	*ha*	*L/sec*	*ha*	*ha*	*L/sec*	*L/sec*	*ha*	*ha*	*L/sec*	*L/sec*	*m*	*%*	*mm*	*L/sec.*	*m/s*	*m/s*
Proposed Development (74 Townhouse Units)	1	1A	EX.	0.35	74.00	0.173	0.173	4	1.8021											0.35	0.35	0.0348	1.8369						
																							Capacity of Immediate Downstream Reach of 250mm dia. Sanitary Sewer =		75.0	0.90	250	56.3872	1.149	



LEGEND:

- SURCHARGING CONDUITS (GREATER THAN 100% CAPACITY)
- SURCHARGING CONDUITS (GREATER THAN 85% CAPACITY)
- PROPOSED WORKS SEWER
- EXISTING SANITARY SEWER
- FORCEMAIN
- PROPOSED FLOW MONITORING STATION

No.	DATE	BY	REVISIONS	MAN	CAD

APPROVALS

Municipal

Engineer

Date

Design	D.H.S.	Checked	P.D.S.	
Drawn	P.D.	Checked	D.H.S.	
Scale	N.T.S.			
Date	OCTOBER 2013			

WASTEWATER COLLECTION SYSTEM
DRAFT FINAL
YEAR 2011 EXISTING CONDITION

The City of BARRIE

amec

Contract No.

Consultant File No.

Drawing No.

SHEET 4 OF 8

P:\Work\110135\Hwy\dwg\Contract\Sanitary\Third_Submission\October Submission\Existing City\04-2011 Surcharge.dwg

APPENDIX C

Water Servicing Calculations

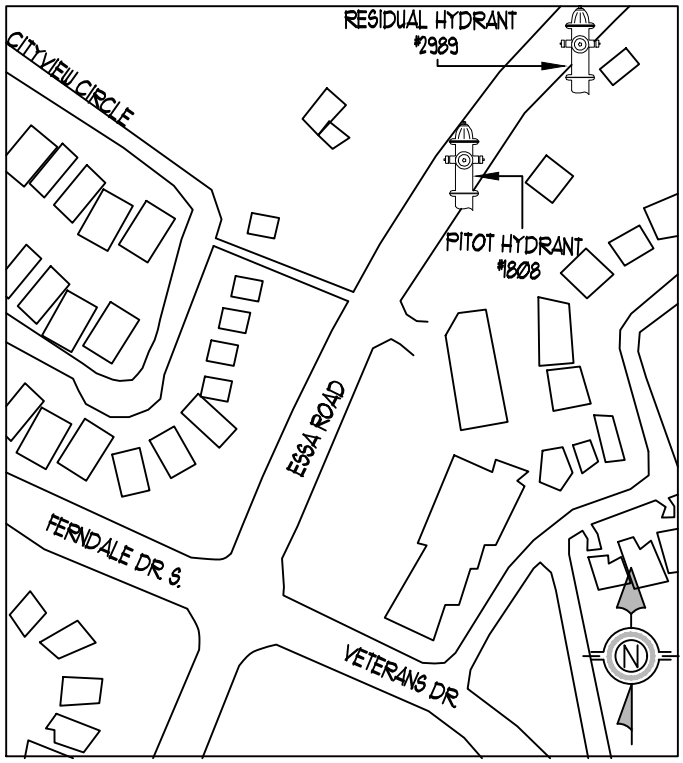
PINESTONE ENGINEERING LTD.

FLOW TEST RESULTS

DATE : APRIL 11, 2018 TIME : 11:30 AM

LOCATION : 390 ESSA ROAD
BARRIE, ONTARIO

TEST BY : VIPOND FIRE PROTECTION AND LOCAL PUC



STATIC PRESSURE : 53 PSI

TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (INCHES)	DISCHARGE CO-EFFICIENT	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	DISCHARGE (U.S. GPM)
1	1	2-1/2"	0.9	50	38	1034
2	2	2-1/2"	0.9	49	24	1644

FIRST FOR FIRE, LIFE SAFETY & SECURITY

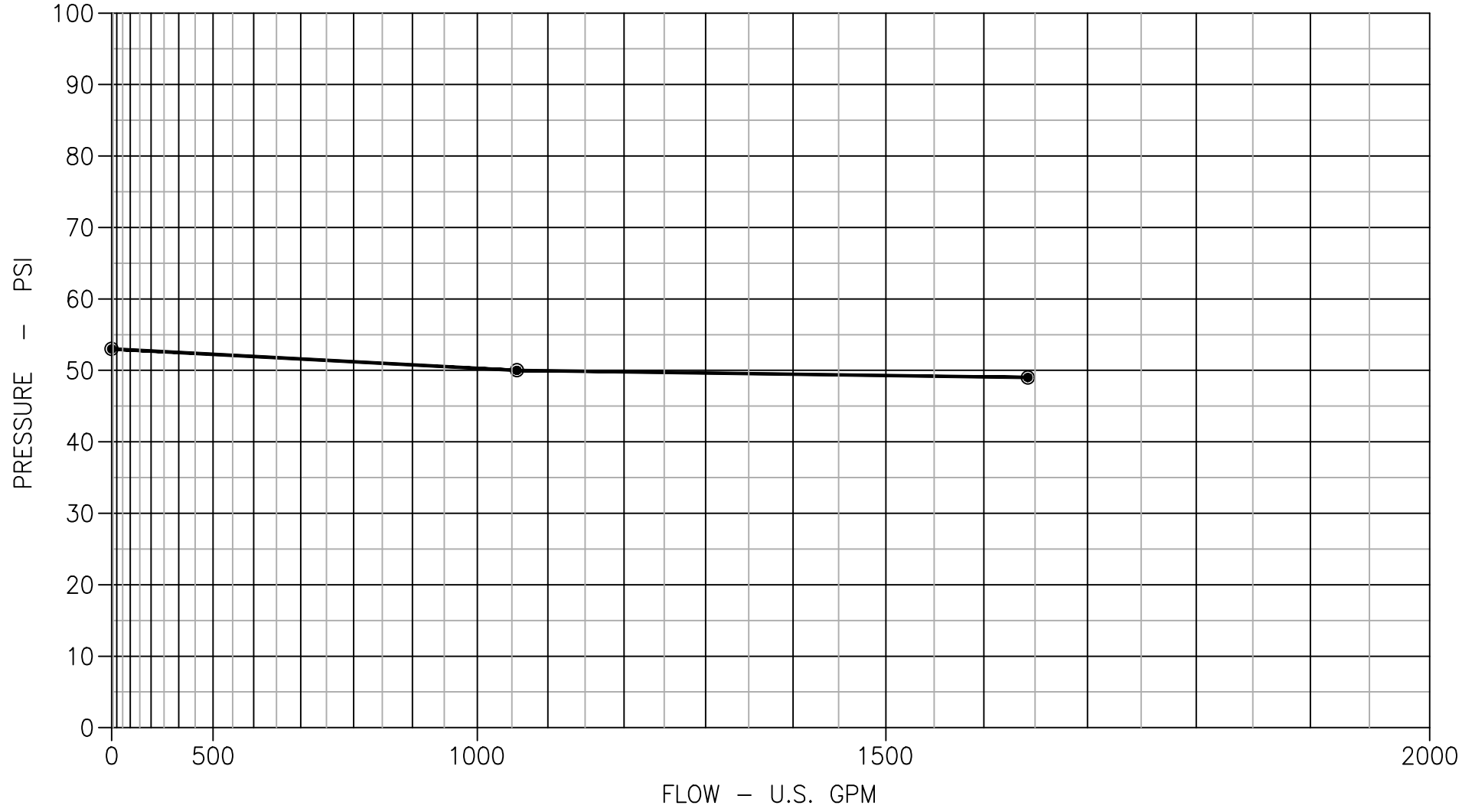
VIPOND INC

est. 1945

390 ESSA ROAD	
BARRIE, ONTARIO	

BY :	MIKE POWELL
VIPOND OFFICE :	BARRIE
TEST BY :	VIPOND & PUC
DATE :	APRIL 11 2018

STATIC:		RESIDUAL:		FLOW:
53 PSI	TEST#1	50 PSI	@	1034 GPM
	TEST#2	49 PSI	@	1644 GPM



Fire Flow Calculations – Fire Underwriters Survey 1999

Building Area = 1256 sm @ 6 floors = 7536 sm

Fire demands for the proposed development were calculated in accordance with the Fire Underwriters Survey (FUS) as follows:

$$F = 220C(A)^{0.5}$$

Where,

F = the required fire flow in litres per minute.

C = coefficient related to the type of construction.

A = total floor area of building (excluding basements) calculated as per FUS

C = 0.6 for fire resistive construction

F = 220*0.6(7536)^0.5
F = 11,500 L/min
F = 192 L/sec

Reductions:

1. Reduction for low hazard occupancy (-25%) – Required Fire Flow = 144 L/sec
2. Reduction for sprinkler systems (-30%) – Required Fire Flow = 101 L/sec

Exposure:

1. Exposure charge for existing building to the east (+15%)
2. Exposure charge for existing building to the south (+10%)

Exposure (+25%) – Required Fire Flow = 126 L/sec

Required fire flow as per FUS 1999 calculation = 126 L/sec

APPENDIX D

Storm Water Management Calculations

PINESTONE ENGINEERING LTD.

Peto MacCallum Ltd.
CONSULTING ENGINEERS

July 18, 2018

PML Ref.: 18BF014
Report: 1

Mr. Bryan Toteda
Encore Development Group
110 Adesso Drive
Unit 8
Concord, Ontario
L4K 3C5

Dear Mr. Toteda

Geotechnical Investigation
Proposed Six Storey Apartment Building
390 Essa Road
Barrie, Ontario

Peto MacCallum Ltd. (PML) is pleased to present the results of the geotechnical investigation recently completed at the above noted project site. Authorization for the work described in this report was provided by Mr. B. Toteda in the email dated March 6, 2018.

A six storey apartment building (without basement) is proposed on the property located at 390 Essa Road in Barrie. An existing residence is currently at the site and will be demolished prior to constructing the proposed building. The proposed building configuration is a rectangle with rounded south end, about 30 m by 65 m in plan. A parking garage is planned at the ground floor, with five residential floors above the parking garage. Site servicing, paved parking and access are planned for the site. Infiltration parameters have been requested for potential Low Impact Development (LID) facilities to help manage storm water. The current planned site configuration is shown on Drawing 1, appended.

The purpose of this investigation was to assess the subsurface conditions at the site, and based on this information, provide comments and geotechnical engineering recommendations for building foundations, site servicing, infiltration parameters and pavement design.

A limited chemical testing program was included with the geotechnical work to check the geoenvironmental quality of the site soils in order to provide comments regarding on-site reuse or off-site disposal options for excess excavated soil.

The comments and recommendations provided in this report are based on the site conditions at the time of the investigation, and are applicable only to the proposed works as addressed in the report. Any changes in the proposed plans will require review by PML to assess the validity of the report, and may require modified recommendations, additional investigation and/or analysis.

INVESTIGATION PROCEDURES

The field work for this investigation was conducted on April 6, 2018, and consisted of Boreholes 1 to 4 advanced to 6.7 m depth. Borehole locations are shown on Drawing 1, appended.

It is noted that the locations of the boreholes were established in the field by PML based on a preliminary drawing provided by the Client and subsequent to the investigation, the latest site configuration was provided.

Co-ordination of clearances of underground utilities was provided by PML with the aid of a sub-contracting private utility locating company. Boreholes were drilled cognizant of utility locates.

The boreholes were advanced using continuous flight solid stem augers, powered by a track mounted D-50 drill rig, equipped with an automatic hammer, supplied and operated by a specialist drilling contractor, working under the full-time supervision of a member of PML's engineering staff.

At the surface of the boreholes, the granular material and topsoil thicknesses encountered were measured and samples of the material collected.

Representative samples of the overburden were recovered at frequent depth intervals for identification purposes using a conventional split spoon sampler. Standard penetration tests were carried out simultaneously with the sampling operations to assess the strength characteristics of the substrata. The ground water conditions in the boreholes were assessed during drilling by visual examination of the soil samples, the sampler, and drill rods as the samples were retrieved, and measurement of water in the open boreholes upon completion, if any.

Boreholes were backfilled as per O.Reg. 903.

Ground surface elevations were referenced to the following Temporary Bench Mark (TBM) provided by the Client, as shown on Drawing 1, and described as follows:

TBM: Temporary Bench Mark
Ground Surface at Northwest Corner of Existing Two-Storey Brick House

Elevation 311.73 (metric, geodetic)

All recovered samples were returned to our laboratory for moisture content determination and detailed examination to confirm field classification. Grain size analyses were carried out on four samples of the major soil types. The results are presented in Figures 1 to 4, attached. Accompanying Atterberg Limits testing was completed on one of these samples.

SUMMARIZED SUBSURFACE CONDITIONS

Reference is made to the appended Log of Borehole sheets for details of the subsurface conditions, including soil classifications, inferred stratigraphy, Standard Penetration Test N values (N Values), ground water observations and the results of laboratory moisture content determinations and Atterberg Limits testing.

Due to the soil sampling procedures and the limited size of samples, the depth/elevation demarcations on the borehole logs must be viewed as “transitional” zones, and cannot be construed as exact geologic boundaries between layers. PML should be retained to assist in defining the geological boundaries in the field during construction, if required.

Topsoil or surface granular was encountered over fill and native layers of silty sand, clayey silt and sand and silt till. A description of the distribution of the subsurface conditions encountered is provided below.

Topsoil was present at the surface of Boreholes 1, 2 and 4, being 150 to 160 mm thick.

Surface granular comprising 250 mm of granular base was observed at the surface of Borehole 3.

Below the topsoil or surface granular, a fill unit composed of sand with variable silt content, trace gravel and local trace organics was noted in all four boreholes, carrying to 1.4 to 2.1 m depth (elevation 309.3 to 310.1). The layer was moist with a water content of 5 to 19%.

Underlying the fill, a native silty sand deposit was encountered in Boreholes 1, 3 and 4 to 2.2 to 4.0 m depth (elevation 307.4 to 308.9). The unit contained trace gravel. A sample of the material was submitted for grain size analysis and the results are presented on Figure 1, appended. The layer was compact to dense (N Values 14 to 41), and was moist to very moist with moisture contents of 9 to 20%.

Beneath the native silty sand deposit, a clayey silt layer was encountered in Boreholes 1, 3 and 4 to 4.0 to 5.5 m depth (elevation 306.0 to 307.1). Two samples of the material were submitted for grain size analyses and the results are presented on Figures 2 and 3, appended. Atterberg Limits testing on one sample showed the material to have a plastic limit of 16% and a liquid limit of 20%. The material was very stiff to hard (N Values of 18 to 45 blows). The clayey silt was typically drier than the plastic limit, with moisture contents ranging from 8 to 19%.

A basal till deposit was encountered in all boreholes. The till occurred below the upper soil units in Boreholes 1, 3 and 4, and below the fill in Borehole 2, and was observed to the 6.7 m depth of exploration in all boreholes. The unit comprised sand and silt with trace clay and gravel. Cobbles and boulders were noted. A sample of the material was submitted for grain size analysis and the results are presented on Figure 4, appended. The relative density of the till unit was compact to very dense and N Values of 14 to 80 blows. The till was moist to very moist with water contents of 8 to 13%.

A summary of the first water strike during drilling and the water measurements conducted upon completion of the boreholes is summarized below:

BOREHOLE	FIRST WATER STRIKE DURING DRILLING		UPON COMPLETION OF AUGERING	
	Depth (m)	Elevation	Depth (m)	Elevation
1	6.1	305.4	No Water	No Water
2	No Water	No Water	No Water	No Water
3	No Water	No Water	No Water	No Water
4	No Water	No Water	No Water	No Water

Based on the above, the stabilized ground water level is considered to be below 6.7 m depth at the time of our investigation. Localized areas of perched water across the site are possible, especially above the till and/or clayey silt.

Ground water levels will fluctuate seasonally, and in response to variations in precipitation.

GEOTECHNCIAL ENGINEERING CONSIDERATIONS

General

A six storey apartment building (without basement) is proposed on the property located at 390 Essa Road in Barrie. An existing residence is currently at the site and will be demolished prior to constructing the proposed building. The proposed building configuration is a rectangle with rounded south end, about 30 m by 65 m in plan. A parking garage is planned at the ground floor, with five residential floors above the parking garage. Site servicing, paved parking and access are planned for the site. Infiltration parameters have been requested for potential Low Impact Development (LID) facilities to help manage storm water. The current planned site configuration is shown on Drawing 1, appended.

Site Grading and Engineered Fill

The grading for the site has not been set however, for purposes of this report, it is assumed that the ground floor slab for the proposed building will be at about elevation 311.5, at or slightly above the existing site grades in the area of the building. Based on this, exterior footings would normally be founded at about elevation 310.0, with interior footings at about elevation 310.9.

At these levels, the boreholes show the floor slab and some footings would be founded on existing fill, which is unsuitable to support footings or floor slabs. As such it is recommended that existing fill be removed and grades raised with engineered fill. Both footings and floor slabs could then be supported on engineered fill, locally footings would be supported on native soils.

In the area of the existing house, the in-situ fill and foundations will have to be removed, such that the extent of the excavation extends to native soil in all directions. It is noted that fill may be deeper around the existing house then indicated on the borehole logs.

Reference is made to Appendix A for guidelines for engineered fill construction. The following general highlights are provided:

- Strip existing topsoil/surface granular, fill, and other deleterious materials down to native inorganic soil. The excavated soil should be segregated and stockpiled for reuse or disposal;
- Proofroll exposed subgrade using a heavy vibrating roller to targeted 100% Standard Proctor maximum dry density, under geotechnical review;
- Following geotechnical review and approval of the subgrade, spread approved material in maximum 200 mm thick lifts and uniformly compacted to 100% Standard Proctor maximum dry density in building areas;
- Subject to geotechnical review during construction, the excavated sand to silty sand fill is generally suitable for reuse as engineered fill, subject to remove of organics, topsoil, oversized (over 150 mm) or otherwise deleterious material. Grades will be raised on the site and as such imported fill is anticipated. Imported material should comprise OPSS Select Subgrade Material (SSM) or OPSS Granular B Type I. Other sources of imported material should be reviewed by our office to ensure suitability;

- The engineered fill pad must extend at least 1 m beyond the structure to be supported, then outwards and downwards at no steeper than 45° to the horizontal to meet the underlying approved native subgrade. In this regard, strict survey control and detailed documentation of the lateral and vertical extent of the engineered fill limits should be carried out to ensure that the engineered fill pad fully incorporates the structure to be supported;

- Engineered fill construction must be carried out under full time field review by PML, to approve sub-excavation and subgrade preparation, backfill materials, placement and compaction procedures, and to verify that the specified compaction standards are achieved throughout.

Foundations

Based on the above, footings will be supported on engineered fill and locally native soil. Footings supported on the upper portion of the native soil and/or engineered fill can be designed for a geotechnical bearing resistance at Serviceability Limit State (SLS) of 150 kPa, and a factored bearing resistance at Ultimate Limit State (ULS) of 225 kPa.

Alternatively, the footings can be stepped down to dense soils anticipated typically below elevation 309.0 in Boreholes 1 and 2 and below elevation 308.0 in Boreholes 3 and 4, where a geotechnical bearing resistance at SLS of 300 kPa, and corresponding factored bearing resistance at ULS of 450 kPa are available for design of footings.

It is noted that in the area of the existing house, fill soil will likely be present below the depths noted on the borehole logs. As such, as discussed above, existing fill and foundations once fully removed will have to be replaced with engineered fill.

The geotechnical bearing resistance at SLS is based on 25 mm or settlement in the bearing stratum with differential settlement not exceeding 75% of the value.

Footings subject to frost action should be provided with a minimum 1.2 m of earth cover or equivalent.

Prior to placement of structural concrete, all founding surfaces should be reviewed by PML to verify the design bearing capacity is available, or to reassess the design parameters based on the actual conditions revealed in the excavation.

Seismic Design

Based on the soil profile revealed in the boreholes, Site Classification D is applicable for Seismic Site Response as set out in Table 4.1.8.4.A of the Ontario Building Code (2012). Based on the type and relative density of the soil cover at the site there is a low potential for liquefaction of soils to occur.

Floor Slab-on-Grade

Floor slab-on-grade construction is feasible on engineered fill, constructed as discussed earlier.

A minimum 200 mm thick base layer of crushed stone (nominal 20 mm size) is recommended directly beneath the floor slab. Where a vapour sensitive floor finish is to be used then the use of polyethylene sheeting or similar means should be incorporation as a vapour barrier.

Exterior grades should be established to promote surface drainage away from the building.

Site Servicing

Design details were not finalized at the time of this report. For purposes of this report, inverts are assumed to be up to 3.5 m below existing grades.

Trench Excavation and Ground Water Control

Trench excavation and ground water control are described later in the report under Excavation and Ground Water Control.

Pipe Bedding

Native silty sand, clayey silt or till is expected at invert levels which is considered satisfactory for pipe support.

Where existing fill or other deleterious material is encountered at the design invert level, such material should be sub-excavated and replaced with an increased thickness of bedding material, subject to geotechnical field review and approval.

Standard Granular A bedding, in accordance with OPSS, compacted to 95% Standard Proctor maximum dry density should be satisfactory. For flexible pipes, bedding and cover material should comprise OPSS Granular A. For rigid pipes, the bedding material should comprise OPSS Granular A and cover material may comprise select native soil free of oversized material.

Trench Backfill

Backfill in trenches should comprise select inorganics soil and be placed in maximum 200 mm thick loose lifts compacted to at least 95% Standard Proctor maximum dry density to minimize post construction settlement in the backfill. Topsoil, organic, excessively wet, frozen oversized (greater than 200 mm), or otherwise deleterious material should not be incorporated as trench backfill. The moisture content of the trench backfill should be within 2% of the optimum moisture content in order to achieve the specified compaction and be close to optimum moisture content in the upper 1 m to prevent subgrade instability issues. Ideally the backfill should comprise excavated site soil, in order to minimize differential frost heave.

The excavated soil will comprise sand to silty sand fill, native silty sand, clayey silt and till. Soil should generally be acceptable for reuse subject to geotechnical review during construction.

Earthworks operations should be inspected by PML to verify subgrade preparation, backfill materials, placement and compaction efforts and ensure the specified degree of compaction is achieved throughout.

Excavation and Ground Water Control

It is anticipated that excavation for the engineered fill/apartment building will extend about 2.0 to 2.5 m below existing grade (locally up to 3.5 m if footings are stepped down to dense soils or possibly in the area of the existing house to remove existing fill and foundations), with excavation for site servicing anticipated to 3.0 to 3.5 m below existing grade. Excavation will encounter fill and native silty sand/clayey silt/till. Harder digging and the presence of boulders should be expected within the till deposit.

The ground water table was generally not encountered during the assignment. Accordingly, it is expected that nuisance ground water seepage should be managed using conventional sump pumping techniques.

Subject to the ground water control as discussed below, the site soils encountered at the site should be considered as Type 3 soil requiring excavation sidewalls to be constructed at no steeper than one horizontal to one vertical (1H:1V) from the base of the excavation in accordance with the Occupational Health and Safety Act.

Water taking in Ontario is governed by the Ontario Water Resources Act (OWRA) and the Water Takings and Transfer Regulation O. Reg. 387/04. Section 34 of the OWRA requires anyone taking more than 50,000 L/d to notify the Ministry of the Environment and Climate Change (MOECC). This requirement applies to all withdrawals, whether for consumption, temporary construction dewatering, or permanent drainage improvements. Where it is assessed than more than 50,000 L/d but less than 400,000 L/d of ground water taking is required, the Owner can register online via the Environmental Activity and Sector Registry (EASR) system. Where it is assessed that more than 400,000 L/d of ground water taking is required then a Category 3 Permit-To-Take-Water (PTTW) is required.

Based on the conditions revealed in the boreholes, a PTTW or registry on the EASR is not anticipated as the excavation will be above the ground water table.

LID Infiltration Parameters

It is understood that infiltration through LID is being considered for storm water management. Details of proposed LID features were not provided.

A summary of the particle size distribution analyses of soils encountered at the site and estimates of permeability are provided below:

FIGURE	BOREHOLE	DEPTH (m)	SOIL DESCRIPTION	ESTIMATED PERMEABILITY, k, (cm/sec)
1	3	2.3 to 2.9	Silty Sand	$1x10^{-3}$ to $1x10^{-4}$
2	1	4.6 to 5.2	Clayey Silt, Trace Sand	<1x10-6
3	4	2.3 to 2.9	Clayey Silt, Some Sand	<1x10-6
4	2	2.3 to 2.9	Sand and Silt Till, Trace Clay, Trace Gravel	1x10-4 to 1x10-6

In general, the silty sand has some infiltration capacity, however, the clayey silt and sand and silt till that underlie the silty sand have little to no infiltration capacity. As such, infiltration facilities are less favourable in areas in which the less pervious soils are encountered at higher elevations (Boreholes 2 and 4 at the north side of the site). The ground water table was generally not encountered during this assignment, however local perched water may exist.

Pavement Design and Construction

Based on the boreholes, it is anticipated that the pavement subgrade will comprise moderately frost susceptible sand/silty sand fill. Based on this, the following pavement structure thicknesses are recommended:

	LIGHT DUTY (CAR PARKING)	HEAVY DUTY (FIRE ROUTE)
Asphalt (mm)	90	110
Granular A Base Course (mm)	150	150
Granular B Subbase Course (mm)	300	450
Total Thickness (mm)	540	710

It is not intended to remove all of the existing fill from under the pavement. However, in order to minimize potential settlement issues it is recommended that following rough grading to the subgrade level, subgrade preparation should include proofrolling and compacting the exposed subgrade with a heavy vibratory compactor to 95% Standard Proctor maximum dry density under geotechnical review. Any unstable zones identified during this process should be sub-excavated and replace with compacted select site material, subject to geotechnical field review.

Imported material for the granular base and subbase should conform to OPSS gradation specifications for Granular A and Granular B, and should be compacted to 100% Standard Proctor maximum dry density. Asphalt should be compacted in accordance with OPSS 310.

For the pavement to function properly, it is essential that provisions be made for water to drain out of and not collect in the base material. The incorporation of subdrains is recommended in conjunction with crowning of the final subgrade to promote drainage towards the pavement edge. Subdrains should be installed at least 300 mm below the subgrade level. Refer to OPSD 216 Series for details regarding pipe, filter fabric or filter sock, bedding and cover material. Maintenance hole/catchbasins should be backfilled with free draining material with frost tapers and stub drains extending out from structures. The above measures will help drain the pavement structure as well as alleviate the problems of differential frost movement between the catchbasins and pavement.

Geotechnical Review and Construction Inspection and Testing

It is recommended that the final design drawings be submitted to PML for geotechnical review for compatibility with site conditions and recommendations of this report.

Earthworks operations should be carried out under the supervision of PML to approve subgrade preparation, backfill materials, placement and compaction procedures and check the specified degree of compaction is achieved throughout.

Prior to placement of structural concrete, all founding surfaces must be inspected by PML to verify the design bearing capacity is available, or to reassess the design parameters based on the actual conditions.

The comments and recommendations provided in the report are based on information revealed in the boreholes. Conditions away from and between boreholes may vary, particularly where foundation and/or service trenches exist. Geotechnical review during construction should be ongoing to confirm the subsurface conditions are substantially similar to those encountered in the boreholes, which may otherwise require modification to the original recommendations.

GEOENVIRONMENTAL CONSIDERATIONS

A limited chemical testing program was carried out to check the geoenvironmental quality of the soil at selected sampling locations in order to provide comments regarding on site reuse or off-site disposal options for excess excavated soil.

A Phase One Environmental Site Assessment (ESA) was not within the scope of work for this assignment. Accordingly, soil impairment that has not been identified by the limited chemical testing program may exist at the site. The limited chemical testing program does not constitute an Environmental Site Assessment as defined under the Environmental Protection Act and O. Reg. 153/04, as amended.

Chemical Testing Protocols

The recovered geoenvironmental soil samples were placed in laboratory air tight glass containers and stored in an insulated cooler for transportation to our laboratory for detailed visual examination.

As part of the geoenvironmental procedural protocol, all recovered soil samples were examined for visual and olfactory evidence of potential contamination. It is noted that none of the samples contained evidence of contamination.

Soil samples were submitted for chemical analysis to a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited laboratory. The chemical analyses conducted were in accordance with the O. Reg. 153/04, as amended Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act dated March 9, 2004, amended as of July 1, 2011.

For general environmental quality characterization, soil samples were tested for the following analyte groups:

- Metals and Inorganics;
- Petroleum Hydrocarbons (F1 to F4 fractions).

The following soil samples were submitted for testing:

Borehole 1 SS 2, (fill – 0.8 to 1.4 m)
Borehole 2 SS 1, (fill – 0.15 to 0.6 m)
Borehole 3 SS 3, (fill – 1.5 to 2.1 m)

Site Condition Standards

In general, the applicable environmental quality guidelines depend on the site location, land use, soil texture and source of potable water at the site. In this regard, we selected the Generic Criteria of the O. Reg. 153/04, as amended, Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act dated April 15, 2011.

Sections 41 and 43 of O.Reg. 153/04, as amended, were used by PML to evaluate the site sensitivity. Based on readily available information, the site is not considered environmentally sensitive.

Further, the site was reviewed against the City's Watercourses (Schedule F, March 2011) and Wells and Wellhead Protection Areas (Schedule G, March 2011) and other maps for watercourses and wells as part of the protocol to determine the applicable Site Condition Standards (SCSs) for the site. In this regard, the site is not within a wellhead protection area, nor is it within 30 m of a water body, however there are private drinking water wells within 250 m of the site, based on the MOECC well records website.

Based on the above reviews, the criteria of Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition for Residential/Parkland/Institutional (RPI) land use, Table 2 RPI SCSs, are considered applicable to the site.

Analytical Findings and Conclusions

The Certificates of Analyses for Chemical Testing are included in Appendix B.

On-Site Reuse

In summary, the concentration of the tested parameters in the submitted soil samples from boreholes were either not detected (below the method detection limit) or were within Table 2 RPI SCSs. Accordingly, excavated site soils can remain on-site for reuse, subject to the discussion below.

It should be noted that the soil conditions between and beyond the sampled locations may differ from those encountered during this assignment. PML should be contacted if impacted soil conditions become apparent during future development to further assess and appropriately handle the materials, if any, and evaluate whether modifications to the conclusions documented in this report are necessary.

This assessment is subject to the Statement of Limitations that is included with this report (Appendix C) which must be read in conjunction with the report.

Off-Site Reuse/Disposal

O.Reg. 153/04, as amended has nine tables outlining SCSs (Tables 1 to 9) for evaluating Environmental Soil Characteristics. These tables are further divided based on land use. The chemical testing results from this project were compared to the various SCSs to evaluate where the excess soil can be transported. Our assessment was limited to Table 2 and Table 3 SCSs, the most common SCSs.

Based on the results of the limited chemical testing, if excavated soil associated with Boreholes 1, 2 and 3 is to be taken off-site, then the SCSs for the receiving site should comply with any one of the following O.Reg. 153/04, as amended, criteria;

- Table 2 (Any land use);
- Table 3 (Any land use).

If a potential receiving site has SCSs other than Table 2 and 3 used for our assessment, then PML should be consulted to ensure that the results meet the applicable SCSs of the proposed receiving site.

Alternatively, excess excavated soil can be transported to a landfill site, however, additional testing for Toxicity Characteristic Leaching Procedure (TCLP) will be required, in accordance with Ontario Regulation 347, Schedule 4, as amended to Ontario Regulation 558/00, dated March 2001.

When transporting excavated site soil to another site the following are recommended:

- The work must be completed in accordance with local by-laws governing soil movement and/or placement at other sites;
- All analytical results and environmental assessment reports must be fully disclosed to the receiving site owners/authorities and they have agreed to receive the material;
- The applicable SCSs for the receiving site have been determined, as confirmed by the environmental consultant and the SCSs are consistent with the chemical quality of the soil originating at the source site;
- Transportation and placement of the surplus soil is monitored by the environmental consultant to check the material is appropriately placed at the pre-approved site;
- The receiving site must be arranged and/or approved in advance of excavation in order to avoid delays during construction. As well, it is noted the chemical testing requirements for various receiving sites is site-specific and additional testing may be required, beyond that provided in this limited sampling and testing report;
- The excavation work should be conducted in accordance with a written Soil Management Plan prepared by a qualified professional to ensure that all surplus excavated material is tested and managed appropriately, and that imported fill material is of suitable quality and meets the SCSs applicable to the site. Reuse of surplus excavated soil on site is also subject to acceptance for reuse by the geotechnical consultant at the time of construction based on geotechnical considerations;
- Additional sampling and chemical testing should be carried out during construction to verify the chemical quality of the excess soil to assess the appropriate management/disposal options for the actual soil leaving the site;

- It is recommended that transportation of fill material from the Source Site (s) to the Receiving Site (s) be carried out in accordance with the MOECC document *Management of Excess Soil – A Guide for Best Management Practices* dated January 2014.

This assessment is subject to the Statement of Limitations that is included with this report (Appendix C) which must be read in conjunction with the report.

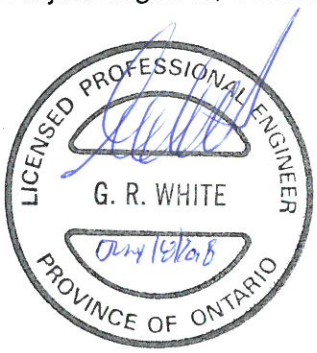
CLOSURE

We trust this report is complete within our terms of reference, and the information presented is sufficient for your present purposes. If you have any questions, or when we may be of further assistance, please do not hesitate to call our office.

Sincerely

Peto MacCallum Ltd.

Richard Blair, P.Eng.
Project Engineer, Geotechnical Services



Geoffrey R. White, P.Eng.
Associate
Manager, Geotechnical and Geoenvironmental Services

RB/GRW:jlb

Enclosures:
Figures 1 to 4 - Particle Size Distribution Charts
List of Abbreviations
Log of Borehole Nos. 1 to 4
Drawing 1 - Borehole Location Plan
Appendix A – Engineered Fill
Appendix B – Certificates of Analyses for Chemical Testing
Appendix C – Statement of Limitations

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 1

17T 603335E 4911374N

PROJECT Proposed Six Storey Apartment Building
LOCATION 390 Essa Road, Barrie, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE April 6, 2018
PML REF. 18BF014
ENGINEER GW
TECHNICIAN AT

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 311.45			
0.0	311.30	TOPSOIL: Black to dark brown. silty sand, trace gravel, moist	1	SS	5
		FILL: Brown, sand, trace to some silt, trace gravel, moist	2	SS	10
1.4	310.1	SILTY SAND: Compact to dense, brown, silty sand, trace gravel, moist to very moist	3	SS	20
2.0			4	SS	35
3.0			5	SS	41
4.0	307.5	CLAYEY SILT: Hard, brown, clayey silt, trace sand, APL	6	SS	41
5.5	306.0	SAND AND SILT TILL: Dense, brown, sand and silt, trace gravel, trace clay, cobbles and boulders, very moist	7	SS	38
6.7	304.8	BOREHOLE TERMINATED AT 6.7 m			

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q (50 100 150 200); DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ● (20 40 60 80)

ELEVATION SCALE: 311 310 309 308 307 306 305

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%) (10 20 30 40)

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

First water strike at 6.1 m

Upon completion of augering
No water
No cave

NOTES 1 - Soil sample submitted for chemical testing.

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 2

17T 603420E 4911437N

PROJECT Proposed Six Storey Apartment Building
LOCATION 390 Essa Road, Barrie, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE April 6, 2018
PML REF. 18BF014
ENGINEER GW
TECHNICIAN AT

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 311.05				
0.15 / 310.90	TOPSOIL: Brown to black, sand, trace silt, trace gravel, moist		1'	SS	3
	FILL: Brown, sand, some silt to silty, trace gravel, moist		2	SS	4
1.4 / 309.7	SAND AND SILT TILL: Compact to very dense, brown, sand and silt, trace clay, trace gravel, cobbles and boulders, moist		3	SS	14
			4	SS	27
			5	SS	39
	Sand layers, very moist		6	SS	80
6.7 / 304.4	BOREHOLE TERMINATED AT 6.7 m		7	SS	54

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER O Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

ELEVATION SCALE: 310, 309, 308, 307, 306, 305

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
No water
No cave

NOTES 1 - Soil sample submitted for chemical testing.

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 3

17T 603421E 4911411N

PROJECT Proposed Six Storey Apartment Building
LOCATION 390 Essa Road, Barrie, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE April 6, 2018
PML REF. 18BF014
ENGINEER GW
TECHNICIAN AT

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES
	SURFACE ELEVATION 311.35				
0.25 / 311.10	SURFACE GRANULAR: 250 mm granular base		1	GS	-
	FILL: Brown, sand, trace to some silt, trace gravel, moist		2	SS	6
2.1 / 309.3			3[1]	SS	6
	SILTY SAND: Compact to dense, brown, silty sand, stratified, moist		4	SS	19
			5	SS	39
4.0 / 307.4	CLAYEY SILT: Hard, brown, clayey silt, trace sand, DTPL				
5.0 / 306.4	SAND AND SILT TILL: Dense to very dense, brown, sand and silt, trace gravel, trace clay, cobbles and boulders, moist		6	SS	45
			7	SS	55
6.7 / 304.7	BOREHOLE TERMINATED AT 6.7 m				

ELEVATION SCALE: 311, 310, 309, 308, 307, 306, 305

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER O Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
No water
No cave

NOTES 1 - Soil sample submitted for chemical testing.

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 4

17T 603429E 4911390N

PROJECT Proposed Six Storey Apartment Building
LOCATION 390 Essa Road, Barrie, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE April 6, 2018
PML REF. 18BF014
ENGINEER GW
TECHNICIAN AT

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 311.10				
0.16	310.94	TOPSOIL: Brown to black, silty sand, trace gravel, very moist		1	SS	4
		FILL: Brown, silty sand, trace gravel, trace organics, moist		2	SS	8
1.4	309.7	SILTY SAND: Compact, brown, silty sand, trace gravel, very moist		3	SS	14
2.2	308.9	CLAYEY SILT: Very stiff, brown, clayey silt, some sand, DTPL		4	SS	18
				5	SS	25
4.0	307.1	SAND AND SILT TILL: Very dense, brown, sand and silt, trace gravel, trace clay, cobbles and boulders, moist to very moist		6	SS	67/290mm
				7	SS	51
6.7	304.4	BOREHOLE TERMINATED AT 6.7 m				

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER O Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

ELEVATION SCALE: 311, 310, 309, 308, 307, 306, 305

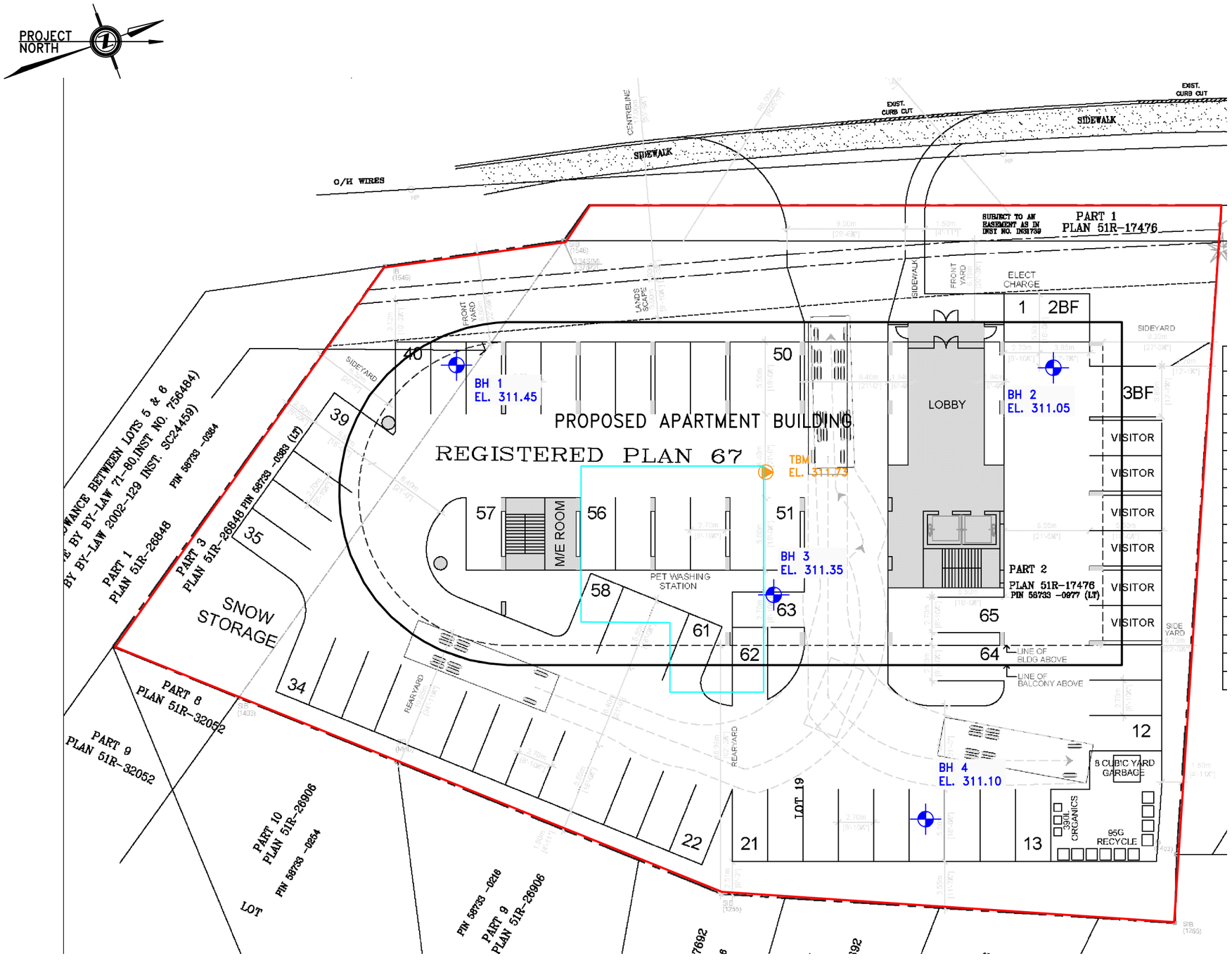
PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

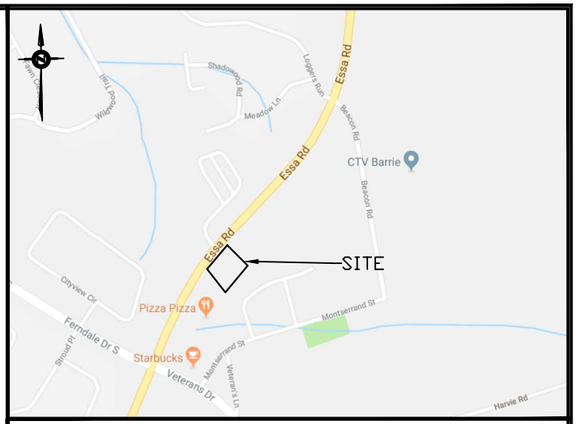
UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
No water
No cave

NOTES





KEY PLAN
BARRIE, ONTARIO

LEGEND:

- SITE LIMITS
- APPROXIMATE LOCATION OF EXISTING HOUSE TO BE DEMOLISHED
- BH 1 EL. 311.45 — BOREHOLE 1 SURFACE ELEVATION
- TBM EL. 311.73 — TEMPORARY BENCH MARK GROUND SURFACE AT NORTHWEST CORNER OF EXISTING TWO-STOREY BRICK HOUSE ELEVATON 311.73 (METRIC, GEODETIC)

REFERENCE:

BASE PLAN PROVIDED BY CLIENT.

0m 4 8 12 16 20
SCALE

BOREHOLE LOCATION PLAN

PROPOSED SIX STOREY APARTMENT BUILDING
390 ESSA ROAD
BARRIE, ONTARIO

Peto MacCallum Ltd.
CONSULTING ENGINEERS

		DATE	SCALE	PML REF.	DRAWING NO.
DRAWN	RB	JULY 2018	AS SHOWN	18BF014	1
CHECKED	GW				
APPROVED	GW				

390 ESSA ROAD

MODIFIED RATIONAL METHOD - PRE-DEVELOPMENT CATCHMENT 101

City of Barrie

Project Number: 17-11346B
Date: August 3, 2018
Design By: LPB
File: \\PINESTONESERVER\Shared Folders\Company\Project Documents\11346B 390 Essa Road FSR\FSR\SWM calculations\Modified Rational Method Calculation Sheet_390 Essa.xls

IDF Curve Parameters				Intensity
Storm Event	A	B	C	(mm/hr)
2 year	678.085	4.699	0.7810	83.11
5 year	853.608	4.699	0.7660	108.92
10 year	975.865	4.699	0.7600	126.55
25 year	1146.275	4.922	0.7570	148.15
50 year	1236.152	4.699	0.7510	164.22
100 year	1426.408	5.273	0.7590	180.15

Tc = 10.0 minutes

$$i = \frac{A}{(t_c + B)^c}$$

i = average rainfall intensity (mm/hr)
A,B,C, = the IDF equation coefficients (dimensionless)
T_c = time of concentration (min)
(see time of concentration calculations for values)

Runoff Coefficients	
Land Use	"C"
Unimproved Area	0.30
Pasture Land	0.40
Woodlot	0.35
Lakes / Swamps	0.05
Impervious Area	0.95
Building Area	0.95
Gravel	0.60
Lawn	0.17
X	0.00
Y	0.00
Z	0.00

Time of Concentration Calculations:

Catchment Parameters			
Catchment ID	=	101	
Catchment Area	=	0.3501	ha
Flow Length	=	50	m
Slope	=	0.01	m/m
Weighted Runoff Coefficient	=	0.33	

Pre-Development Runoff Coefficients:

Catchment	Total Area (m^2)	Unimproved Area (m^2)	Pasture Area (m^2)	Woodlot Area (m^2)	Lakes/Swamps Area (m^2)	Impervious Area (m^2)	Building Area (m^2)	Gravel Area (m^2)	Lawn Area (m^2)	X Area (m^2)	Y Area (m^2)	Z Area (m^2)	Weighted C
101	3,501					75	314	570	2,542				0.33

Runoff Coefficient Adjustment for 25-100 yr Storm Events:

Catchment	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
101	0.33	0.33	0.33	0.36	0.39	0.41

Pre-Development Peak Flow Rates:

Catchment	2-Year (m^3/s)	5-Year (m^3/s)	10-Year (m^3/s)	25-Year (m^3/s)	50-Year (m^3/s)	100-Year (m^3/s)
101	0.026	0.035	0.040	0.052	0.063	0.072

Notes:

1) Runoff coefficients from City of Barrie Storm Drainage and SWM Policies and Design Guidelines Table 3.2
2) Runoff coefficients for events greater than the 10 year storm have been adjusted as per City Policies and Guidelines Table 3.3

390 ESSA ROAD

MODIFIED RATIONAL METHOD - POST DEVELOPMENT CATCHMENT 201 (Building Rooftop - Controlled)

City of Barrie

Project Number: 17-11346B
Date: August 3, 2018
Design By: LPB
File: \\PINESTONESERVER\Shared Folders\Company\Project Documents\11346B 390 Essa Road FSR\FSR\SWM calculations\Modified Rational Method Calculation Sheet_390 Essa.xls

IDF Curve Parameters				Intensity
Storm Event	A	B	C	(mm/hr)
2 year	678.085	4.699	0.7810	83.11
5 year	853.608	4.699	0.7660	108.92
10 year	975.865	4.699	0.7600	126.55
25 year	1146.275	4.922	0.7570	148.15
50 year	1236.152	4.699	0.7510	164.22
100 year	1426.408	5.273	0.7590	180.15

Tc = 10.0 minutes

$$i = \frac{A}{(t_c + B)^c}$$

I = average rainfall intensity (mm/hr)
A,B,C, = the IDF equation coefficients (dimensionless)
T_c = time of concentration (min)
(see time of concentration calculations for values)

Runoff Coefficients	
Land Use	"C"
Unimproved Area	0.30
Pasture Land	0.40
Woodlot	0.35
Lakes / Swamps	0.05
Impervious Area	0.95
Building Area	0.95
Gravel	0.60
Lawn	0.17
X	0.00
Y	0.00
Z	0.00

Time of Concentration Calculations:

Catchment Parameters			
Catchment ID	=	201	
Catchment Area	=	0.1240	ha
Flow Length	=	20	m
Slope	=	0.015	m/m
Weighted Runoff Coefficient	=	0.95	

Pre-Development Runoff Coefficients:

Catchment	Total Area (m^2)	Unimproved Area (m^2)	Pasture Area (m^2)	Woodlot Area (m^2)	Lakes/Swamps Area (m^2)	Impervious Area (m^2)	Building Area (m^2)	Gravel Area (m^2)	Lawn Area (m^2)	X Area (m^2)	Y Area (m^2)	Z Area (m^2)	Weighted C
201	1,240						1,240						0.95

Runoff Coefficient Adjustment for 25-100 yr Storm Events:

Catchment	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
201	0.95	0.95	0.95	1.00	1.00	1.00

Post-Development Peak Flow Rates:

Catchment	2-Year (m^3/s)	5-Year (m^3/s)	10-Year (m^3/s)	25-Year (m^3/s)	50-Year (m^3/s)	100-Year (m^3/s)
201	0.027	0.036	0.041	0.051	0.057	0.062

Notes:
1) Runoff coefficients from City of Barrie Storm Drainage and SWM Policies and Design Guidelines Table 3.2
2) Runoff coefficients for events greater than the 10 year storm have been adjusted as per City Policies and Guidelines Table 3.3

390 ESSA ROAD

MODIFIED RATIONAL METHOD - POST DEVELOPMENT CATCHMENT 202 (Parking Lot - Controlled)

City of Barrie

Project Number: 17-11346B
Date: August 3, 2018
Design By: LPB
File: \\PINESTONESERVER\Shared Folders\Company\Project Documents\11346B 390 Essa Road FSR\FSR\SWM calculations\Modified Rational Method Calculation Sheet_390 Essa.xls

IDF Curve Parameters				Intensity
Storm Event	A	B	C	(mm/hr)
2 year	678.085	4.699	0.7810	83.11
5 year	853.608	4.699	0.7660	108.92
10 year	975.865	4.699	0.7600	126.55
25 year	1146.275	4.922	0.7570	148.15
50 year	1236.152	4.699	0.7510	164.22
100 year	1426.408	5.273	0.7590	180.15

Tc = 10.0 minutes

$$i = \frac{A}{(t_c + B)^c}$$

I = average rainfall intensity (mm/hr)
A,B,C, = the IDF equation coefficients (dimensionless)
T_c = time of concentration (min)
(see time of concentration calculations for values)

Runoff Coefficients	
Land Use	"C"
Unimproved Area	0.30
Pasture Land	0.40
Woodlot	0.35
Lakes / Swamps	0.05
Impervious Area	0.95
Building Area	0.95
Gravel	0.60
Lawn	0.17
X	0.00
Y	0.00
Z	0.00

Time of Concentration Calculations:

Catchment Parameters			
Catchment ID	=	202	
Catchment Area	=	0.1134	ha
Flow Length	=	20	m
Slope	=	0.02	m/m
Weighted Runoff Coefficient	=	0.95	

Pre-Development Runoff Coefficients:

Catchment	Total Area (m^2)	Unimproved Area (m^2)	Pasture Area (m^2)	Woodlot Area (m^2)	Lakes/Swamps Area (m^2)	Impervious Area (m^2)	Building Area (m^2)	Gravel Area (m^2)	Lawn Area (m^2)	X Area (m^2)	Y Area (m^2)	Z Area (m^2)	Weighted C
202	1,134					1,134							0.95

Runoff Coefficient Adjustment for 25-100 yr Storm Events:

Catchment	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
202	0.95	0.95	0.95	1.00	1.00	1.00

Post-Development Peak Flow Rates:

Catchment	2-Year (m^3/s)	5-Year (m^3/s)	10-Year (m^3/s)	25-Year (m^3/s)	50-Year (m^3/s)	100-Year (m^3/s)
202	0.025	0.033	0.038	0.047	0.052	0.057

Notes:

1) Runoff coefficients from City of Barrie Storm Drainage and SWM Policies and Design Guidelines Table 3.2
2) Runoff coefficients for events greater than the 10 year storm have been adjusted as per City Policies and Guidelines Table 3.3

390 ESSA ROAD

MODIFIED RATIONAL METHOD - POST DEVELOPMENT CATCHMENT 203

City of Barrie

Project Number: 17-11346B
Date: August 3, 2018
Design By: LPB
File: \\PINESTONESERVER\Shared Folders\Company\Project Documents\11346B 390 Essa Road FSR\FSR\SWM calculations\Modified Rational Method Calculation Sheet_390 Essa.xls

IDF Curve Parameters				Intensity
Storm Event	A	B	C	(mm/hr)
2 year	678.085	4.699	0.7810	83.11
5 year	853.608	4.699	0.7660	108.92
10 year	975.865	4.699	0.7600	126.55
25 year	1146.275	4.922	0.7570	148.15
50 year	1236.152	4.699	0.7510	164.22
100 year	1426.408	5.273	0.7590	180.15

Tc = 10.0 minutes

$$i = \frac{A}{(t_c + B)^c}$$

I = average rainfall intensity (mm/hr)
A,B,C, = the IDF equation coefficients (dimensionless)
T_c = time of concentration (min)
(see time of concentration calculations for values)

Runoff Coefficients	
Land Use	"C"
Unimproved Area	0.30
Pasture Land	0.40
Woodlot	0.35
Lakes / Swamps	0.05
Impervious Area	0.95
Building Area	0.95
Gravel	0.60
Lawn	0.17
X	0.00
Y	0.00
Z	0.00

Time of Concentration Calculations:

Catchment Parameters			
Catchment ID	=	203	
Catchment Area	=	0.1127	ha
Flow Length	=	10	m
Slope	=	0.04	m/m
Weighted Runoff Coefficient	=	0.24	

Pre-Development Runoff Coefficients:

Catchment	Total Area (m^2)	Unimproved Area (m^2)	Pasture Area (m^2)	Woodlot Area (m^2)	Lakes/Swamps Area (m^2)	Impervious Area (m^2)	Building Area (m^2)	Gravel Area (m^2)	Lawn Area (m^2)	X Area (m^2)	Y Area (m^2)	Z Area (m^2)	Weighted C
203	1,127					100			1,027				0.24

Runoff Coefficient Adjustment for 25-100 yr Storm Events:

Catchment	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
203	0.24	0.24	0.24	0.26	0.29	0.30

Post-Development Peak Flow Rates:

Catchment	2-Year (m^3/s)	5-Year (m^3/s)	10-Year (m^3/s)	25-Year (m^3/s)	50-Year (m^3/s)	100-Year (m^3/s)
203	0.006	0.008	0.009	0.012	0.015	0.017

Notes:

1) Runoff coefficients from City of Barrie Storm Drainage and SWM Policies and Design Guidelines Table 3.2
2) Runoff coefficients for events greater than the 10 year storm have been adjusted as per City Policies and Guidelines Table 3.3

390 ESSA ROAD

MODIFIED RATIONAL METHOD - PRE TO POST DEVELOPMENT FLOW SUMMARY

City of Barrie

PINESTONE ENGINEERING LTD.

Project Number: 17-11346B
Date: August 3, 2018
Design By: LPB
File: \\PINESTONESERVER\Shared Folders\Company\Project Documents\11346B 390 Essa Road FSR\FSR\SWM calculations\Modified Rational Method Calculation Sheet_390 Essa.xls

Catchment	2 Year (m^3/s)	5 Year (m^3/s)	10 Year (m^3/s)	25 Year (m^3/s)	50 Year (m^3/s)	100 Year (m^3/s)
Pre-Development Catchment 101	0.026	0.035	0.040	0.052	0.063	0.072
Total Pre-Development Flow	0.026	0.035	0.040	0.052	0.063	0.072
Post Development Catchment 201 (Rooftop - controlled)	0.027	0.036	0.041	0.051	0.057	0.062
Post Development Catchment 202 (Parking Lot - controlled)	0.025	0.033	0.038	0.047	0.052	0.057
Post Development Catchment 203 (uncontrolled)	0.006	0.008	0.009	0.012	0.015	0.017
Total Post Development Flow	0.058	0.076	0.089	0.110	0.123	0.136
Total Difference from Post to Pre	**0.032**	**0.042**	**0.049**	**0.058**	**0.060**	**0.064**
Allowable Post Development flow from Catchments 201 and 202	**0.020**	**0.026**	**0.031**	**0.040**	**0.048**	**0.055**

390 ESSA ROAD

Quantity Control Storage Calculations - Catchment 201&202 Combined

City of Barrie

PINESTONE ENGINEERING LTD.

Project Number: 17-11346B
Date: August 3, 2018
Design By: LPB
File: \\PINESTONESERVER\Shared Folders\Company\Project Documents\11346B 390 Essa Road FSR\FSR\SWM calculations\Modified Rational Method Calculation Sheet_390 Essa.xls

2 Year Storm Event

Total Area 0.2374 ha.
Runoff Coefficient 0.95
Release Rate 11 l/sec <= allowable of 0.011 (m3/sec)
Tc 10.0

Time (mins.)	Intensity (mm/hr)	Peak Inflow (m^3/sec)	Release Rate (m^3/sec)	Required Storage Volume (m^3)	
10.0	83.1	0.052	0.011	24.88806514	
11	78.9	0.050	0.011	25.64140169	
12	75.2	0.048	0.011	26.28249059	
13	71.9	0.045	0.011	26.82732634	
14	68.9	0.043	0.011	27.28881793	
15	66.1	0.042	0.011	27.67751816	
16	63.6	0.040	0.011	28.00215252	
17	61.3	0.039	0.011	28.27000959	
18	59.2	0.037	0.011	28.48723399	
19	57.2	0.036	0.011	28.65904922	
20	55.4	0.035	0.011	28.78992961	
21	53.7	0.034	0.011	28.8837344	
22	52.1	0.033	0.011	28.9438135	
23	50.7	0.032	0.011	28.97309183	
24	49.3	0.031	0.011	28.97413704	<- Required Volume
25	48.0	0.030	0.011	28.94921446	
26	46.8	0.030	0.011	28.90033203	
27	45.6	0.029	0.011	28.82927724	
28	44.5	0.028	0.011	28.73764779	
29	43.5	0.027	0.011	28.62687714	
30	42.5	0.027	0.011	28.49825597	
31	41.6	0.026	0.011	28.35295025	
32	40.7	0.026	0.011	28.19201662	
33	39.8	0.025	0.011	28.01641543	
34	39.0	0.025	0.011	27.82702202	
35	38.3	0.024	0.011	27.62463625	
36	37.5	0.024	0.011	27.40999094	
37	36.8	0.023	0.011	27.18375898	
38	36.1	0.023	0.011	26.9465597	
39	35.5	0.022	0.011	26.6989643	
40	34.9	0.022	0.011	26.44150068	
41	34.3	0.022	0.011	26.17465766	
42	33.7	0.021	0.011	25.89888873	
43	33.1	0.021	0.011	25.61461532	
44	32.6	0.021	0.011	25.32222975	
45	32.1	0.020	0.011	25.0220978	
46	31.6	0.020	0.011	24.71456106	
47	31.1	0.020	0.011	24.39993901	
48	30.7	0.019	0.011	24.07853083	
49	30.2	0.019	0.011	23.75061712	
50	29.8	0.019	0.011	23.41646138	
51	29.4	0.019	0.011	23.07631136	

5 Year Storm Event

Total Area	0.2374 ha.		
Runoff Coefficient	0.95		
Release Rate	15.0 l/sec <= allowable of	0.017	(m3/sec)
Tc	10.0		

Time (mins.)	Intensity (mm/hr)	Peak Inflow (m^3/sec)	Release Rate (m^3/sec)	Required Storage Volume (m^3)	
10.0	108.9	0.069	0.015	32.26954029	
11	103.6	0.065	0.015	33.26451043	
12	98.8	0.062	0.015	34.11303757	
13	94.5	0.060	0.015	34.83574853	
14	90.6	0.057	0.015	35.44931865	
15	87.0	0.055	0.015	35.96740123	
16	83.8	0.053	0.015	36.40130254	
17	80.8	0.051	0.015	36.76048075	
18	78.1	0.049	0.015	37.05292072	
19	75.5	0.048	0.015	37.28541955	
20	73.2	0.046	0.015	37.46380706	
21	71.0	0.045	0.015	37.59311799	
22	69.0	0.044	0.015	37.67772797	
23	67.0	0.042	0.015	37.72146202	
24	65.2	0.041	0.015	37.72768176	<- Required Volume
25	63.6	0.040	0.015	37.69935637	
26	62.0	0.039	0.015	37.63912045	
27	60.5	0.038	0.015	37.54932184	
28	59.0	0.037	0.015	37.43206123	
29	57.7	0.036	0.015	37.28922524	
30	56.4	0.036	0.015	37.12251421	
31	55.2	0.035	0.015	36.93346563	
32	54.0	0.034	0.015	36.72347412	
33	52.9	0.033	0.015	36.49380834	
34	51.9	0.033	0.015	36.24562563	
35	50.9	0.032	0.015	35.9799845	
36	49.9	0.032	0.015	35.69785547	
37	49.0	0.031	0.015	35.4001305	
38	48.1	0.030	0.015	35.08763114	
39	47.3	0.030	0.015	34.76111571	
40	46.5	0.029	0.015	34.4212856	
41	45.7	0.029	0.015	34.06879074	
42	44.9	0.028	0.015	33.70423453	
43	44.2	0.028	0.015	33.3281781	
44	43.5	0.027	0.015	32.94114421	
45	42.8	0.027	0.015	32.54362058	
46	42.2	0.027	0.015	32.13606299	
47	41.6	0.026	0.015	31.71889798	
48	41.0	0.026	0.015	31.29252527	
49	40.4	0.025	0.015	30.85731999	
50	39.8	0.025	0.015	30.41363461	
51	39.3	0.025	0.015	29.96180075	

10 Year Storm Event

Total Area	0.2374 ha.		
Runoff Coefficient	0.95		
Release Rate	18.0 l/sec <= allowable of	0.022	(m3/sec)
Tc	10.0		

Time (mins.)	Intensity (mm/hr)	Peak Inflow (m^3/sec)	Release Rate (m^3/sec)	Required Storage Volume (m^3)	
10.0	126.5	0.080	0.018	37.14735157	
11	120.4	0.076	0.018	38.28875422	
12	114.9	0.073	0.018	39.260357	
13	109.9	0.069	0.018	40.08596617	
14	105.4	0.067	0.018	40.78484006	
15	101.3	0.064	0.018	41.37275682	
16	97.6	0.062	0.018	41.86279017	
17	94.1	0.059	0.018	42.26588313	
18	91.0	0.057	0.018	42.5912793	
19	88.0	0.056	0.018	42.84685147	
20	85.3	0.054	0.018	43.03935557	
21	82.8	0.052	0.018	43.17462907	
22	80.4	0.051	0.018	43.25774768	
23	78.2	0.049	0.018	43.29315046	<- Required Volume
24	76.1	0.048	0.018	43.28474051	
25	74.1	0.047	0.018	43.23596671	
26	72.3	0.046	0.018	43.14989067	
27	70.6	0.045	0.018	43.02924186	
28	68.9	0.044	0.018	42.87646343	
29	67.4	0.043	0.018	42.69375041	
30	65.9	0.042	0.018	42.48308184	
31	64.5	0.041	0.018	42.24624791	
32	63.1	0.040	0.018	41.984873	
33	61.9	0.039	0.018	41.70043537	
34	60.6	0.038	0.018	41.39428397	
35	59.5	0.038	0.018	41.06765299	
36	58.4	0.037	0.018	40.72167442	
37	57.3	0.036	0.018	40.35738891	
38	56.3	0.036	0.018	39.97575529	
39	55.3	0.035	0.018	39.57765888	
40	54.3	0.034	0.018	39.16391875	
41	53.4	0.034	0.018	38.7352941	
42	52.6	0.033	0.018	38.29248999	
43	51.7	0.033	0.018	37.8361623	
44	50.9	0.032	0.018	37.36692217	
45	50.1	0.032	0.018	36.88533997	
46	49.4	0.031	0.018	36.39194886	
47	48.7	0.031	0.018	35.8872479	
48	48.0	0.030	0.018	35.37170491	
49	47.3	0.030	0.018	34.84575902	
50	46.6	0.029	0.018	34.30982296	
51	46.0	0.029	0.018	33.76428513	

25 Year Storm Event

Total Area	0.2374	ha	
Runoff Coefficient	1.00		
Release Rate	20.00	l/sec <= allowable of	0.031 (m3/sec)
Tc	10.0		

Time (mins.)	Intensity (mm/hr)	Peak Inflow (m^3/sec)	Release Rate (m^3/sec)	Required Storage Volume (m^3)	
10.0	148.2	0.098	0.020	47.08697425	
11	141.1	0.094	0.020	48.68128224	
12	134.7	0.090	0.020	50.06472482	
13	129.0	0.086	0.020	51.26650274	
14	123.8	0.082	0.020	52.31030423	
15	119.0	0.079	0.020	53.21558459	
16	114.7	0.076	0.020	53.99849957	
17	110.7	0.074	0.020	54.67259827	
18	107.0	0.071	0.020	55.24934555	
19	103.6	0.069	0.020	55.73852144	
20	100.5	0.067	0.020	56.14853042	
21	97.5	0.065	0.020	56.48664372	
22	94.8	0.063	0.020	56.75919118	
23	92.2	0.061	0.020	56.97171455	<- Required Volume
24	89.8	0.060	0.020	57.12909129	
25	87.5	0.058	0.020	57.23563514	
26	85.3	0.057	0.020	57.29517859	
27	83.3	0.055	0.020	57.31114105	
28	81.4	0.054	0.020	57.28658532	
29	79.6	0.053	0.020	57.22426499	
30	77.8	0.052	0.020	57.12666423	
31	76.2	0.051	0.020	56.99603142	
32	74.6	0.050	0.020	56.83440775	
33	73.1	0.049	0.020	56.64365171	
34	71.7	0.048	0.020	56.42546004	
35	70.3	0.047	0.020	56.18138576	
36	69.0	0.046	0.020	55.91285389	
37	67.8	0.045	0.020	55.62117494	
38	66.6	0.044	0.020	55.30755686	
39	65.4	0.043	0.020	54.97311529	
40	64.3	0.043	0.020	54.61888277	
41	63.3	0.042	0.020	54.24581665	
42	62.2	0.041	0.020	53.85480622	
43	61.3	0.041	0.020	53.44667899	
44	60.3	0.040	0.020	53.02220621	
45	59.4	0.039	0.020	52.58210786	
46	58.5	0.039	0.020	52.12705707	
47	57.6	0.038	0.020	51.65768408	
48	56.8	0.038	0.020	51.1745798	
49	56.0	0.037	0.020	50.678299	
50	55.2	0.037	0.020	50.16936318	
51	54.5	0.036	0.020	49.6482632	

50 Year Storm Event

Total Area	0.2374	ha.	
Runoff Coefficient	1.00		
Release Rate	25.00	l/sec <= allowable of	0.039 (m3/sec)
Tc	10.0		

Time (mins.)	Intensity (mm/hr)	Peak Inflow (m^3/sec)	Release Rate (m^3/sec)	Required Storage Volume (m^3)	
10.0	164.2	0.109	0.025	50.49810604	
11	156.3	0.104	0.025	52.0732437	
12	149.2	0.099	0.025	53.41716055	
13	142.8	0.095	0.025	54.56204998	
14	137.1	0.091	0.025	55.53398083	
15	131.8	0.088	0.025	56.35433107	
16	127.0	0.084	0.025	57.04083033	
17	122.6	0.081	0.025	57.60833161	
18	118.5	0.079	0.025	58.06939162	
19	114.7	0.076	0.025	58.43471354	
20	111.2	0.074	0.025	58.71348921	
21	108.0	0.072	0.025	58.91366673	
22	104.9	0.070	0.025	59.04216203	
23	102.0	0.068	0.025	59.10502776	
24	99.4	0.066	0.025	59.10758935	<- Required Volume
25	96.8	0.064	0.025	59.05455559	
26	94.5	0.063	0.025	58.95010915	
27	92.2	0.061	0.025	58.79798128	
28	90.1	0.060	0.025	58.60151375	
29	88.1	0.059	0.025	58.36371075	
30	86.2	0.057	0.025	58.08728238	
31	84.3	0.056	0.025	57.77468147	
32	82.6	0.055	0.025	57.42813486	
33	81.0	0.054	0.025	57.04967013	
34	79.4	0.053	0.025	56.64113846	
35	77.9	0.052	0.025	56.20423438	
36	76.4	0.051	0.025	55.74051283	
37	75.1	0.050	0.025	55.25140401	
38	73.7	0.049	0.025	54.73822626	
39	72.5	0.048	0.025	54.20219738	
40	71.2	0.047	0.025	53.64444454	
41	70.1	0.047	0.025	53.06601303	
42	68.9	0.046	0.025	52.46787394	
43	67.8	0.045	0.025	51.85093103	
44	66.8	0.044	0.025	51.21602675	
45	65.8	0.044	0.025	50.56394769	
46	64.8	0.043	0.025	49.89542935	
47	63.9	0.042	0.025	49.2111605	
48	63.0	0.042	0.025	48.51178703	
49	62.1	0.041	0.025	47.79791544	
50	61.2	0.041	0.025	47.07011596	
51	60.4	0.040	0.025	46.3289254	

100 Year Storm Event

Total Area	0.2374	ha.	
Runoff Coefficient	1.00		
Release Rate	30.00	l/sec <= allowable of	0.046 (m3/sec)
Tc	10.0		

Time (mins.)	Intensity (mm/hr)	Peak Inflow (m^3/sec)	Release Rate (m^3/sec)	Required Storage Volume (m^3)	
10.0	180.2	0.120	0.030	53.85139084	
11	171.7	0.114	0.030	55.52211747	
12	164.1	0.109	0.030	56.93312306	
13	157.2	0.105	0.030	58.11986189	
14	151.0	0.100	0.030	59.11119851	
15	145.3	0.097	0.030	59.9309136	
16	140.1	0.093	0.030	60.59860862	
17	135.3	0.090	0.030	61.13153004	
18	130.9	0.087	0.030	61.54319337	
19	126.7	0.084	0.030	61.84586234	
20	122.9	0.082	0.030	62.04992114	
21	119.4	0.079	0.030	62.16436708	
22	116.0	0.077	0.030	62.19704293	<- Required Volume
23	112.9	0.075	0.030	62.15482316	
24	109.9	0.073	0.030	62.04376455	
25	107.2	0.071	0.030	61.86922897	
26	104.6	0.070	0.030	61.63598422	
27	102.1	0.068	0.030	61.34828737	
28	99.8	0.066	0.030	61.00995427	
29	97.5	0.065	0.030	60.62441759	
30	95.4	0.063	0.030	60.19477591	
31	93.4	0.062	0.030	59.72383509	
32	91.5	0.061	0.030	59.21414362	
33	89.7	0.060	0.030	58.66802281	
34	88.0	0.058	0.030	58.08759272	
35	86.3	0.057	0.030	57.4747945	
36	84.7	0.056	0.030	56.8314098	
37	83.2	0.055	0.030	56.15907759	
38	81.7	0.054	0.030	55.45930886	
39	80.3	0.053	0.030	54.73349952	
40	79.0	0.052	0.030	53.98294166	
41	77.7	0.052	0.030	53.20883353	
42	76.4	0.051	0.030	52.41228837	
43	75.2	0.050	0.030	51.59434216	
44	74.1	0.049	0.030	50.7559606	
45	72.9	0.048	0.030	49.89804527	
46	71.9	0.048	0.030	49.02143915	
47	70.8	0.047	0.030	48.12693156	
48	69.8	0.046	0.030	47.21526261	
49	68.8	0.046	0.030	46.28712717	
50	67.9	0.045	0.030	45.34317848	
51	67.0	0.045	0.030	44.38403139	

390 ESSA ROAD

PRELIMINARY FLOW SUMMARY WITH SWM IN EFFECT

City of Barrie

PINESTONE ENGINEERING LTD.

Project Number:	17-11346B
Date:	August 3, 2018
Design By:	LPB
File:	\\PINESTONESERVER\Shared Folders\Company\Project Documents\11346B 390 Essa Road FSR\FSR\SWM calculations\Modified Rational Method Calculation Sheet_390 Essa.xls

Storm Event	2 Year (m^3/s)	5 Year (m^3/s)	10 Year (m^3/s)	25 Year (m^3/s)	50 Year (m^3/s)	100 Year (m^3/s)
Pre-Development Catchment 101	0.026	0.035	0.040	0.052	0.063	0.072
Total Pre-Development Flow	0.026	0.035	0.040	0.052	0.063	0.072
Post Development Catchment 201 (Building Roof Top - controlled) - Routed to Catchment 202	0.009	0.009	0.009	0.009	0.009	0.009
Post Development Catchment 202 (Parking Lot - controlled)	0.011	0.015	0.018	0.020	0.025	0.030
Post Development Catchment 203 (Landscape - uncontrolled)	0.006	0.008	0.009	0.012	0.015	0.017
Total Post Development Flow (with SWM)	0.026	0.032	0.036	0.041	0.049	0.056

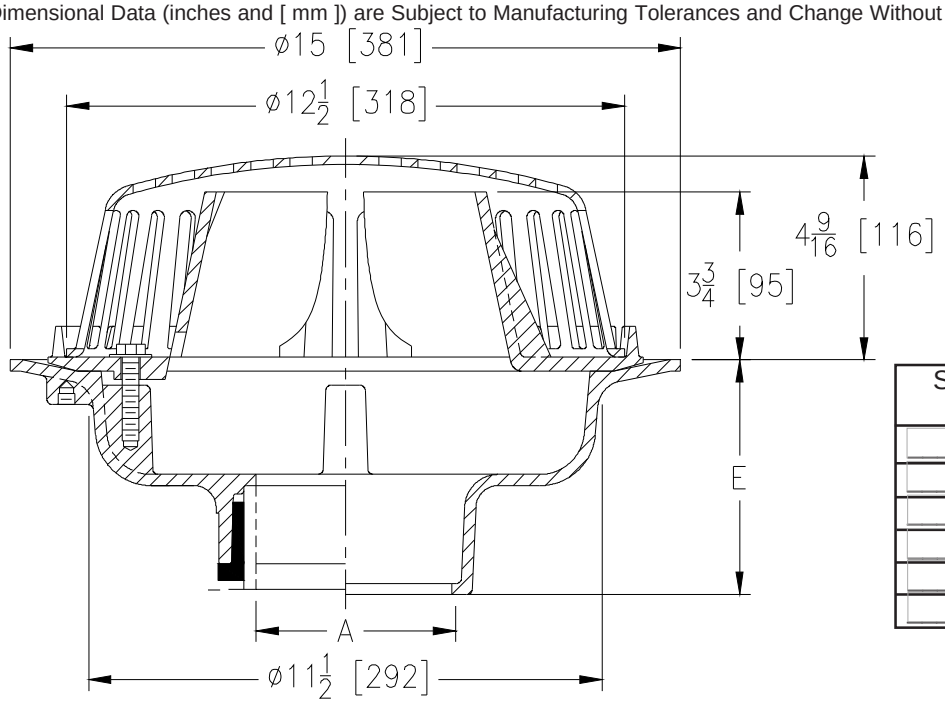
Z105

CONTROL-FLO ROOF DRAIN
W/ PARABOLIC WEIR

SPECIFICATION SHEET

TAG _____

Dimensional Data (inches and [mm]) are Subject to Manufacturing Tolerances and Change Without Notice



Specify Number of Notches in Weir	
___ -N1	One Notch
___ -N2	Two Notches
___ -N3	Three Notches
___ -N4	Four Notches
___ -N5	Five Notches
___ -N6	Six Notches

A- Pipe Size In.[mm]	Approx. Wt. Lbs. [kg]	Dome Open Area Sq. In. [cm²]
2,3,4 [51,76,102]	34 [15]	103 [665]

ENGINEERING SPECIFICATION: ZURN Z105
15" [381mm] Diameter Control-Flo roof drain for dead-level roof construction, Dura-Coated cast iron body, Control-Flo weir shall be linear functioning with integral membrane flashing clamp/gravel guard and Poly-Dome. All data shall be verified proportional to flow rates. Each notch will allow 10 GPM [LPM] of flow per 1" [25mm] of rain water build up above the drain.

OPTIONS (Check/specify appropriate options)

PIPE SIZE
3, 4 [76, 102]
2 , 3, 4 [51, 76, 102]
2 , 3, 4 [51, 76, 102]

(Specify size/type) **OUTLET**
_____ IC Inside Caulk
_____ NH No-Hub
_____ NL Neo-Loc

E BODY HT. DIM.
5-1/4 [133]
5-1/4 [133]
4-9/16 [116]

PREFIXES
___ Z D.C.C.
___ ZA D.C.C.
___ ZC D.C.C.

Using 3 roof drains on the building:
10gallons/inch = 0.63 L/sec / 25.4mm = 3.1 L/sec @ assumed max ponding depth of 125mm permitted on rooftop.
Using 3 drains peak outflow from roof = 3.1L/sec * 3 = 9.3L/sec
Controlled maximum peak flow rate discharging to subsurface storage system = 9.3L/sec.

SUFFIXES
___ -C Underc
___ -DP Top-Se
___ -E Static
___ -EA Adjustable Extension Assembly 2-1/8 [54] thru 3-1/2 [89]
___ -G Galvanized Cast Iron
___ -R Roof Sump Receiver
___ -TC Neo-Loc Test Cap Gasket (2,3,4 [51,76,102] NL Bottom Outlet Only)
___ -VP Vandal Proof Secured Top
___ -10 6 [152] High Parabolic Weir for Sloped Roof (ZC or ZA)

* Regularly furnished unless otherwise specified.

Zurn Industries, LLC | **Specification Drainage Operation**
1801 Pittsburgh Avenue, Erie, PA U.S.A. 16502 · Ph. 855-663-9876, Fax 814-454-7929
In Canada | **Zurn Industries Limited**
3544 Nashua Drive, Mississauga, Ontario L4V 1L2 · Ph. 905-405-8272, Fax 905-405-1292
www.zurn.com

Rev. K
Date: 09/25/17
C.N. No. 137793
Prod. | Dwg. No. Z105

ADVANCED DRAINAGE SYSTEMS, INC.

390 Essa Road

Barrie

STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH SC-740, SC-310, OR APPROVED EQUAL.
2. CHAMBERS SHALL BE MANUFACTURED FROM VIRGIN POLYPROPYLENE OR POLYETHYLENE RESINS.
3. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
4. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
5. CHAMBERS SHALL MEET ASTM F2922 (POLYETHYLENE) OR ASTM F2418 (POLYPROPYLENE), "STANDARD SPECIFICATION FOR THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
6. CHAMBERS SHALL BE DESIGNED AND ALLOWABLE LOADS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
7. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. THE CHAMBER MANUFACTURER SHALL SUBMIT THE FOLLOWING UPON REQUEST TO THE SITE DESIGN ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:
   a. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY AASHTO FOR THERMOPLASTIC PIPE.
   b. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE 50 YEAR CREEP MODULUS DATA SPECIFIED IN ASTM F2418 OR ASTM F2922 MUST BE USED AS PART OF THE AASHTO STRUCTURAL EVALUATION TO VERIFY LONG-TERM PERFORMANCE.
   c. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL EVALUATION IS BASED.
8. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF THE SC-310/SC-740 SYSTEM

1. STORMTECH SC-310 & SC-740 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/SC-780 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS.

   STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm).
8. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
9. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
2. THE USE OF CONSTRUCTION EQUIPMENT OVER SC-310 & SC-740 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADERS, DUMP TRUCKS, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

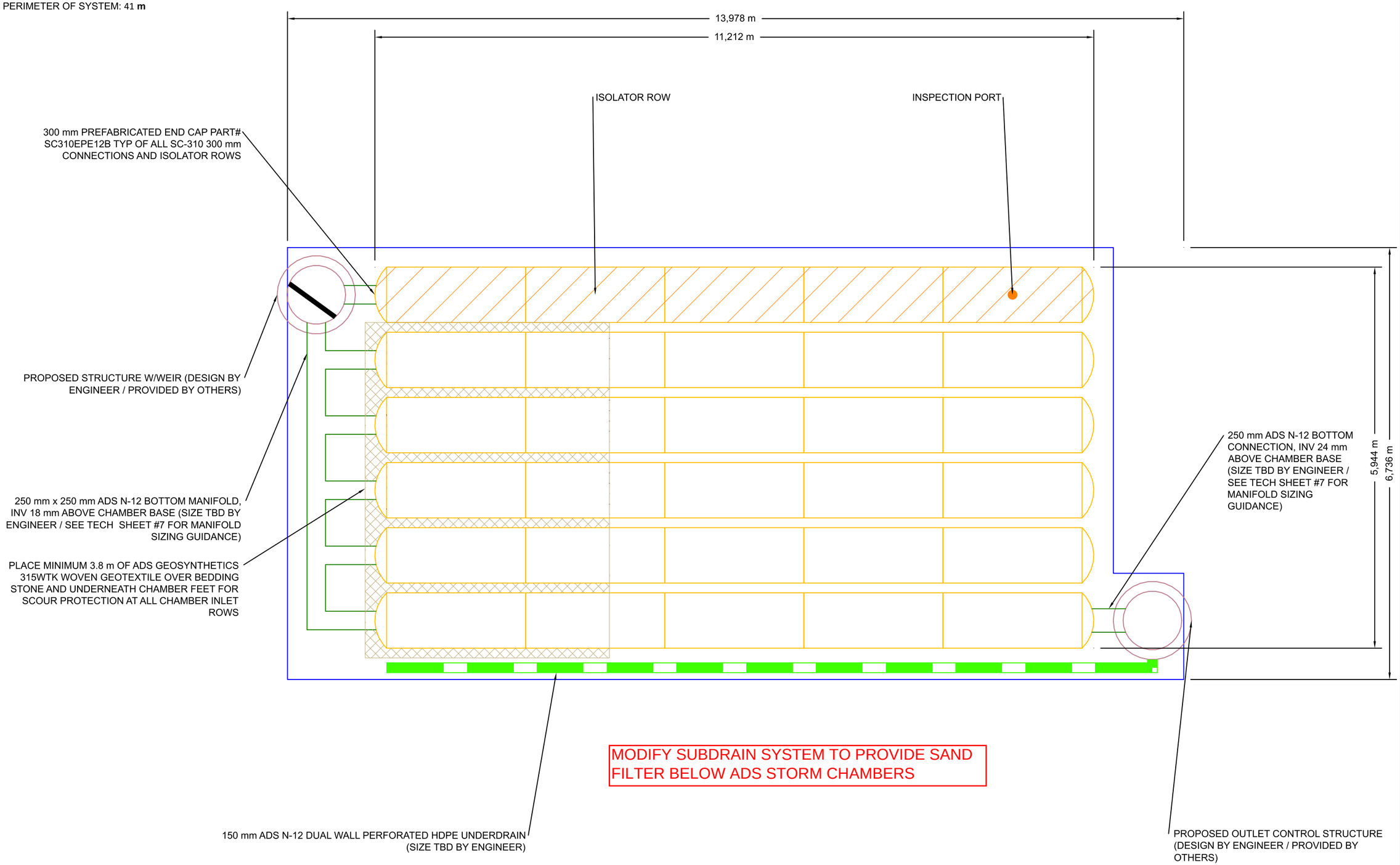
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO THE CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

CONCEPTUAL LAYOUT

(30) STORMTECH SC-310 CHAMBERS
(12) STORMTECH SC-310 END CAPS
INSTALLED WITH 200 mm COVER STONE, 200 mm BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME: 36 m³
AREA OF SYSTEM: 89 **m²**
PERIMETER OF SYSTEM: 41 **m**

COMPUTER GENERATED CONCEPTUAL LAYOUT - NOT FOR CONSTRUCTION



390 Essa Road
Barrie

DATE: 08/03/2018 | DRAWN: JV | CHECKED: ---
PROJECT #: Tool

REV	DRW	CHK	DESCRIPTION

StormTech®
Detention- Retention- Water Quality
70 INWOOD ROAD, SUITE 3 | ROCKY HILL | CT | 06067
860-529-8188 |888-892-2694 | WWW.STORMTECH.COM

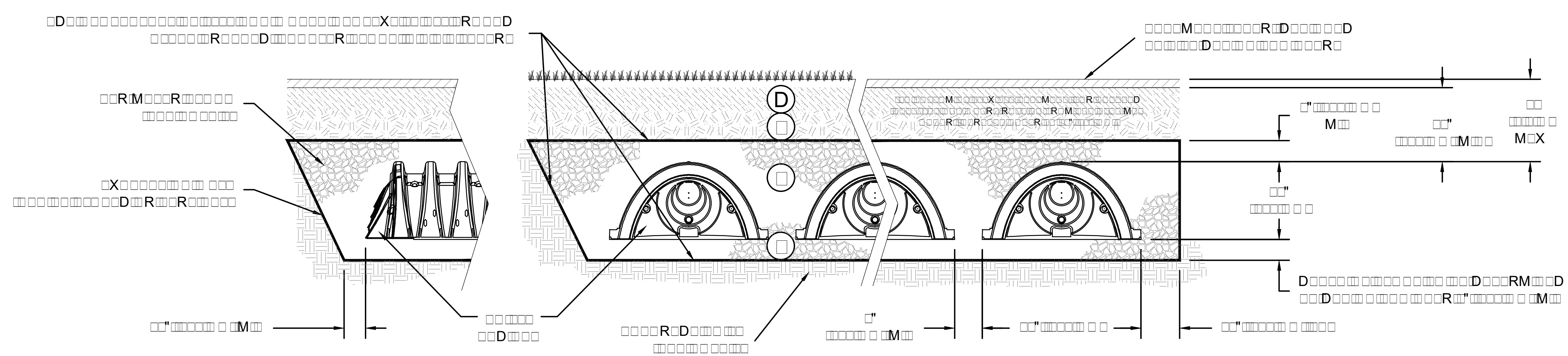
ADS®
ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

NOT TO SCALE

ACCEPTABLE FILL MATERIALS: STORMTECH SC-310 CHAMBER SYSTEMS

[illegible]		[illegible]	[illegible]	[illegible]
D	**FINAL FILL:** [illegible]	[illegible]	[illegible]	[illegible]
[illegible]	**INITIAL FILL:** [illegible]	[illegible]	[illegible]	[illegible]
[illegible]	**EMBEDMENT STONE:** [illegible]	[illegible]	[illegible]	[illegible]
[illegible]	**FOUNDATION STONE:** [illegible]	[illegible]	[illegible]	[illegible] SURFACE. [2] [3]

[illegible]



NOTES:

[illegible]

390 Essa Road
Barrie

08/03/2018

JV

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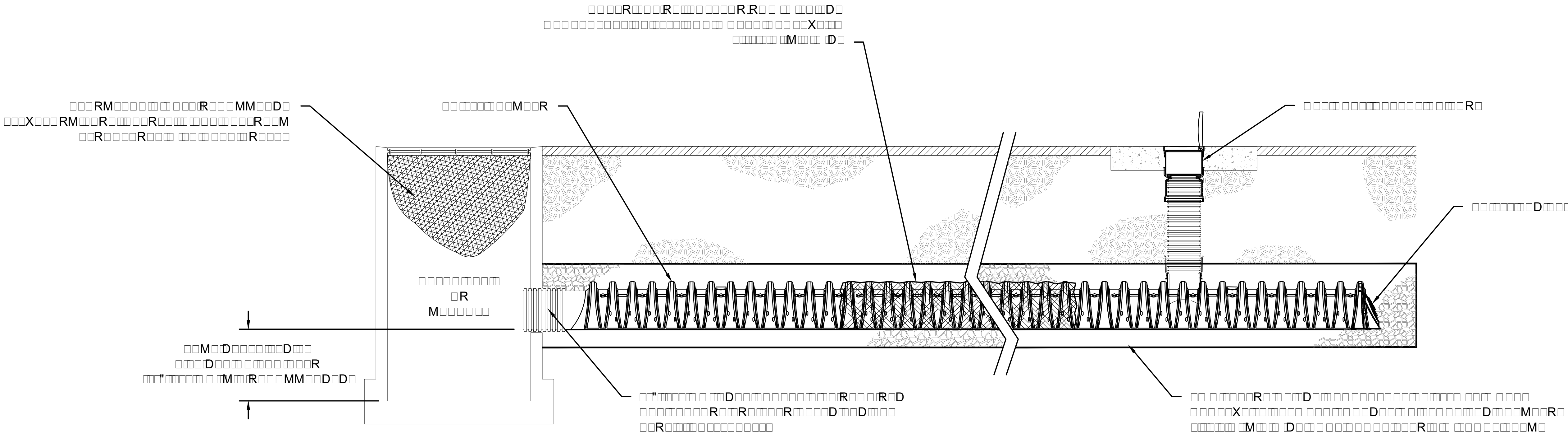
ADS
ADVANCED DRAINAGE SYSTEMS, INC.

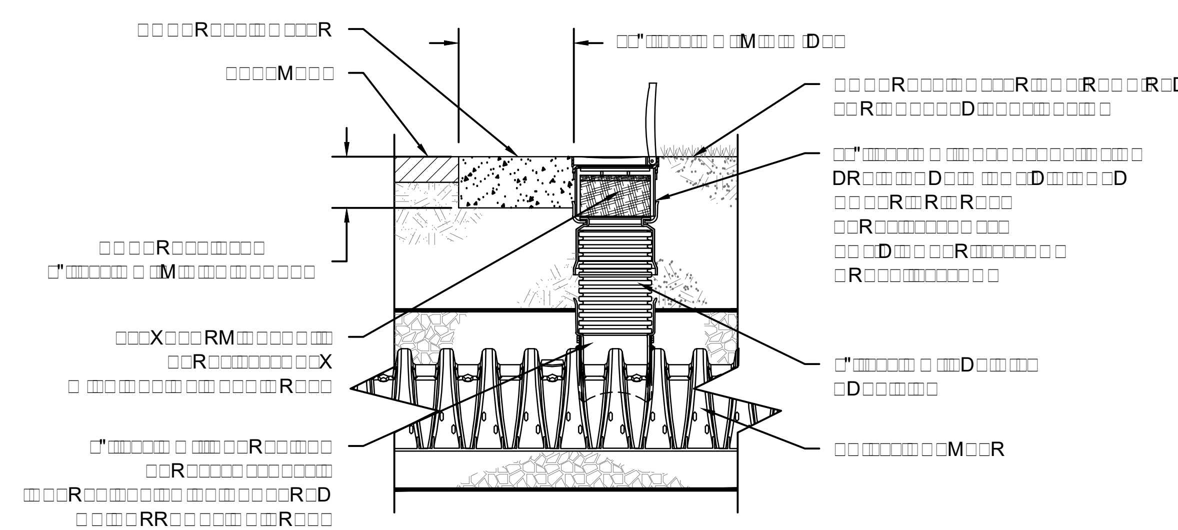
3 [illegible] 5



SC-310 ISOLATOR ROW DETAIL

INSPECTION & MAINTENANCE

NOTES



SC-310 6" INSPECTION PORT DETAIL

390 Essa Road
Barrie

08/03/2018

JV

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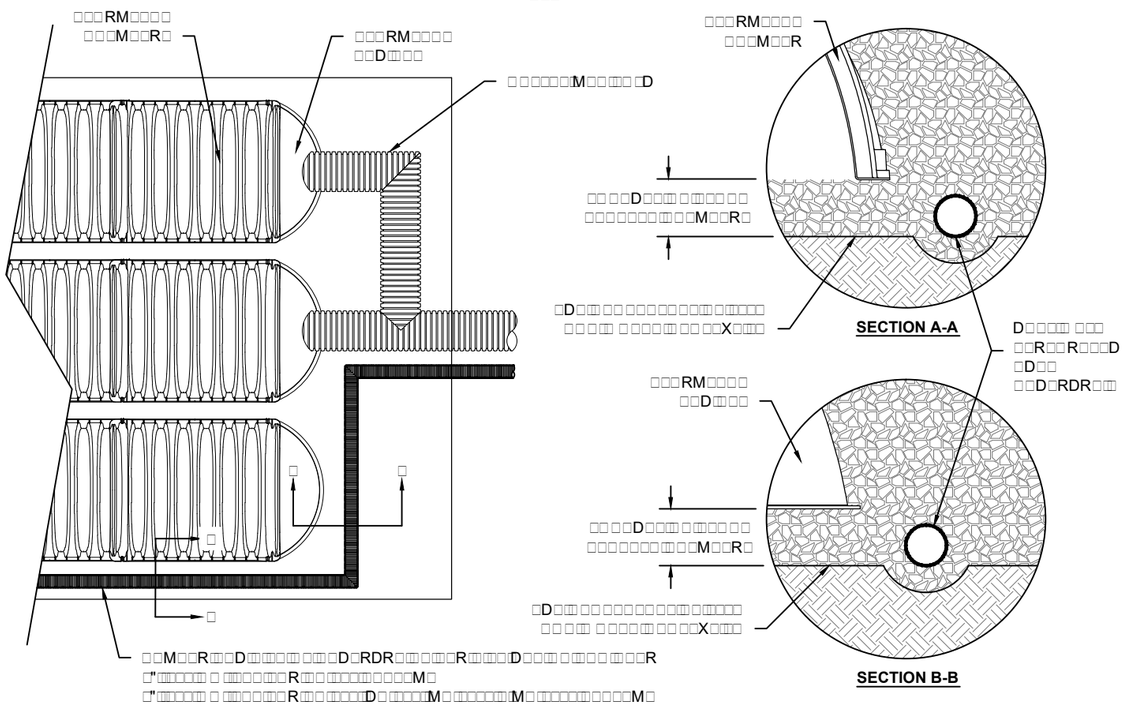
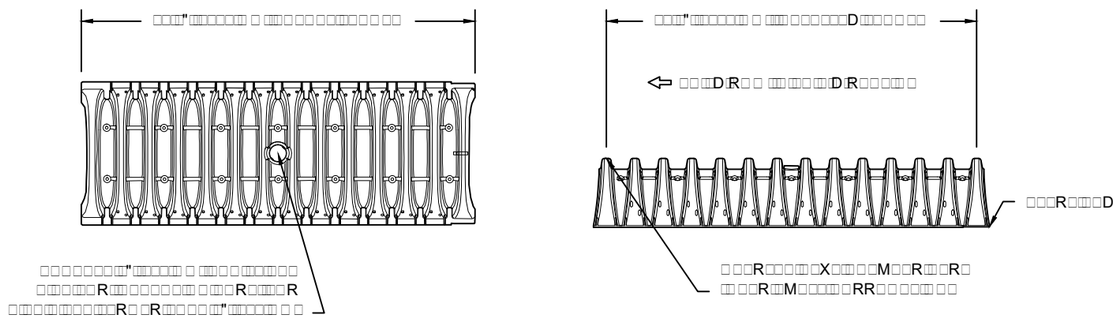
ADVANCED DRAINAGE SYSTEMS, INC.

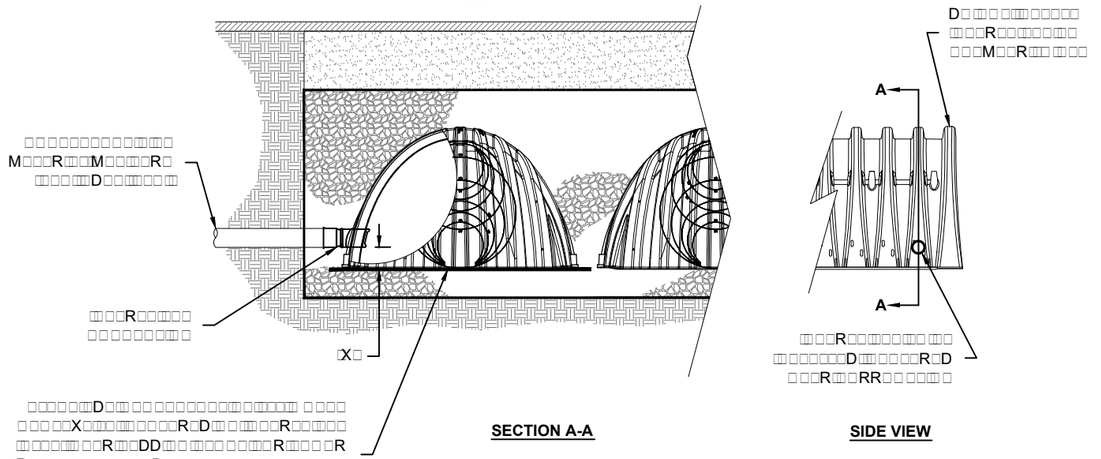
UNDERDRAIN DETAIL



SC-310 TECHNICAL SPECIFICATION



INSERTA TEE DETAIL



NOTE:

NOMINAL CHAMBER SPECIFICATIONS

(0.42 m³)		
(0.88 m³)		

CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)

PART #	STUB	A	B	C

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08/03/2018

5 5

Brief Stormceptor Sizing Report - 390 Essa Road

Project Information & Location			
Project Name	390 Essa Road	**Project Number**	8374
City	Barrie	**State/ Province**	Ontario
Country	Canada	**Date**	8/7/2018
Designer Information		**EOR Information (optional)**	
Name	Joe Voisin	**Name**	
Company	PEL	**Company**	
Phone #	705-645-8853	**Phone #**	
Email	jvoisin@pel.ca	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	390 Essa Road
Target TSS Removal (%)	80
TSS Removal (%) Provided	86
Recommended Stormceptor Model	STC 750

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary		
Stormceptor Model	**% TSS Removal Provided**	**% Runoff Volume Captured Provided**
STC 300	78	94
STC 750	86	99
STC 1000	87	99
STC 1500	87	99
STC 2000	90	100
STC 3000	91	100
STC 4000	93	100
STC 5000	93	100
STC 6000	94	100
STC 9000	96	100
STC 10000	96	100
STC 14000	97	100
StormceptorMAX	Custom	Custom

Stormceptor®

FORTERRA

Sizing Details

Drainage Area	
Total Area (ha)	0.237
Imperviousness %	100.0

Rainfall	
Station Name	BARRIE WPCC
State/Province	Ontario
Station ID #	0557
Years of Records	36
Latitude	44°23'N
Longitude	79°41'W

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	90.00
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	
Water Quality Flow Rate (L/s)	

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.000	0.000

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	

Particle Size Distribution (PSD)
The selected PSD defines TSS removal

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Notes

• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
• Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
• For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

Ontario
MINISTRY OF THE ENVIRONMENT

Database Version: V 2.0 Release Update
Update Date: 30-Mar-12

Project DEVELOPMENT Summary

DEVELOPMENT: 390 Essa Road
Subwatershed: Barrie Creeks

Total Pre-Development Area (ha):	**0.35**	Total Pre-Development Phosphorus Load (kg/yr)	**0.05**

Pre-Development Land Use	Area (ha)	P coeff. (kg/ha)	P Load (kg/yr)
Low Intensity Development	0.35	0.13	0.05

POST-DEVELOPMENT LOAD

Post-Development Land Use	Area (ha)	P coeff. (kg/ha)	Best Management Practice applied with P Removal Efficiency		P Load (kg/yr)
High Intensity - Residential	0.35	1.32	NONE	0%	0.46

		P Load (kg/yr)
Post-Development Area Altered:	**0.35**	
Total Pre-Development Area:	**0.35**	
Unaffected Area:	**0**	
Pre-Development:		**0.05**
Post-Development:		**0.46**
Change (Pre - Post):		**-0.42**
915% Net Increase in Load		
Post-Development (with BMPs):		**0.46**
Change (Pre - Post):		**-0.42**
915.38% Net Increase in Load		

APPENDIX E

Alectra & Enbridge Gas Correspondence

PINESTONE ENGINEERING LTD.

Joe Voisin

From: Stephen Cranley <stephen.cranley@alectrautilities.com>
Sent: April 19, 2018 9:33 AM
To: Lauren Buss
Subject: RE: 390 Essa Road Barrie - Functional Servicing Report

Hi Lauren,

I can confirm that Alectra has an existing 3 phase distribution overhead circuit along the frontage of 390 Essa Road that could be utilized to service the proposed development.

If the proposal for this site is a typical residential townhouse development requiring single phase power (120/240V) to the individual units then, you and/or the developer will need to contact Tony D'Onofrio (Supervisor, Subdivisions – Email: tony.donofrio@alectrautilities.com) regarding hydro design and servicing requirements.

Otherwise if 3 phase servicing is required I will continue to be the contact going forward.

Regards,

Steve

From: Lauren Buss [mailto:lbuss@pel.ca]
Sent: April-18-18 3:13 PM
To: Stephen Cranley
Subject: RE: 390 Essa Road Barrie - Functional Servicing Report

Hi Stephen,

Thanks for you reply. There will be surface parking. The proposed building is raised on columns from what I understand. At this point, it's unknown if the development will require single or 3 phase servicing but, could you let me know if 3 phase is available?

Respectfully,

Lauren

From: Stephen Cranley <stephen.cranley@alectrautilities.com>
Sent: April 18, 2018 10:51 AM
To: Lauren Buss <lbuss@pel.ca>
Subject: RE: 390 Essa Road Barrie - Functional Servicing Report

Hi Lauren,

I am no longer supervising our subdivision department however, could you tell me if this townhouse development will require single phase or 3 phase servicing. Hard for me to determine from reviewing the plan provided. Will there be such things as underground parking for this site?

Thanks,

alectra utilities
Discover the possibilities

Stephen Cranley
Supervisor, Distribution Design, ICI
161 Cityview Boulevard, Vaughan, ON L4H 0A9
t 905.417.6900 x31297 | **m** 705.241.7950
alectrautilities.com

From: Lauren Buss [mailto:lbuss@pel.ca]
Sent: April-18-18 10:06 AM
To: Stephen Cranley; David.Smith@enbridge.com
Subject: 390 Essa Road Barrie - Functional Servicing Report

Hi Stephen and David,

We are working on a Functional Servicing Report for a proposed residential townhouse development located at 390 Essa Road, Barrie. I have appended a drawing showing the proposed development for your reference.

Can you please comment on servicing availability on your end?

Thanks in advance.

Respectfully,

Lauren Buss, EIT, B.Eng.
Engineering Intern

PEL PINESTONE ENGINEERING LTD.

20 Bell Farm Road, Unit 1, Barrie, ON, L4M 6E4
lbuss@pel.ca | PEL.ca

T: 705-503-1777
F: 705-645-7262

Joe Voisin

From: David Smith <David.Smith@enbridge.com>
Sent: April 23, 2018 4:02 PM
To: Lauren Buss
Subject: RE: 390 Essa Road Barrie - Functional Servicing Report

Hi Lauren.

We do have gas available for this site based on 1.5m3/hr/unit.

Thanks.

David K. Smith
Customer Connections Field Representative
—
ENBRIDGE GAS DISTRIBUTION
TEL: 705-739-5254 | FAX: 705-739-5200 | CELL: 705-220-5997
10 Churchill Dr. Barrie, ON L4N 8Z5
David.smith@enbridge.com

enbridgegas.com
Integrity. Safety. Respect.

From: Lauren Buss [mailto:lbuss@pel.ca]
Sent: Monday, April 23, 2018 9:03 AM
To: David Smith
Subject: [External] RE: 390 Essa Road Barrie - Functional Servicing Report

Hi David,

Just use the condominium standard for now, it will be 75 units.

I asked Joe for his input and he is confident we do not need a header.

Thanks for all your help!

Respectfully,

Lauren

From: David Smith <David.Smith@enbridge.com>
Sent: April 19, 2018 2:35 PM
To: Lauren Buss <lbuss@pel.ca>
Subject: RE: 390 Essa Road Barrie - Functional Servicing Report

Hi Lauren.

I will get a high level gas availability completed.

Do you know what will be used for gas fired equipment for each unit? If not I can use our condominium standard.

A header is a gas main on private property. If this site had two buildings we would install a header with a service coming off the header to each building. Having said that we also need a header if we have two meter location on one building. An example is if we bank 35meters on one end of the building and the other 40 are at the other end. Maybe double check this too?

Give me a call if it not clear.

Thanks.

David K. Smith
Customer Connections Field Representative
—
ENBRIDGE GAS DISTRIBUTION
TEL: 705-739-5254 | FAX: 705-739-5200 | CELL: 705-220-5997
10 Churchill Dr. Barrie, ON L4N 8Z5
David.smith@enbridge.com

enbridgegas.com
Integrity. Safety. Respect.

From: Lauren Buss [mailto:lbuss@pel.ca]
Sent: Thursday, April 19, 2018 2:19 PM
To: David Smith
Subject: [External] RE: 390 Essa Road Barrie - Functional Servicing Report

Hi David,

Yes my apologies. It will be a six storey apartment complex with 75 units and require one service, I believe.

Could you also explain what a header is? I'm curious!

Lauren

From: David Smith <David.Smith@enbridge.com>
Sent: April 18, 2018 12:15 PM
To: Lauren Buss <lbuss@pel.ca>; stephen.cranley@alectrautilities.com
Subject: RE: 390 Essa Road Barrie - Functional Servicing Report

Hi Lauren.

Can you tell me a little more about the site.

# of Units
# of Buildings

Do we need a header on the property. Will there be multiple meter locations or can they be fed by one service?

The above would help.

Thanks.

David K. Smith
Customer Connections Field Representative
—
ENBRIDGE GAS DISTRIBUTION
TEL: 705-739-5254 | FAX: 705-739-5200 | CELL: 705-220-5997
10 Churchill Dr. Barrie, ON L4N 8Z5
David.smith@enbridge.com

enbridgegas.com
Integrity. Safety. Respect.

From: Lauren Buss [mailto:lbuss@pel.ca]
Sent: Wednesday, April 18, 2018 10:06 AM
To: stephen.cranley@alectrautilities.com; David Smith
Subject: [External] 390 Essa Road Barrie - Functional Servicing Report

Hi Stephen and David,

We are working on a Functional Servicing Report for a proposed residential townhouse development located at 390 Essa Road, Barrie. I have appended a drawing showing the proposed development for your reference.

Can you please comment on servicing availability on your end?

Thanks in advance.

Respectfully,

Lauren Buss, EIT, B.Eng.
Engineering Intern

20 Bell Farm Road, Unit 1, Barrie, ON, L4M 6E4
lbuss@pel.ca | PEL.ca

T: 705-503-1777
F: 705-645-7262

APPENDIX F

Preliminary Drawings

PINESTONE ENGINEERING LTD.

ESSA ROAD

EX. SAN INV. 307.94

EXISTING ASPHALT DRIVEWAY

EX. T&EV

EXISTING 200mmø PVC WATERMAIN (APPROX.)

EX. STMMH T/G 310.87 NE INV. 308.25 SW INV. 309.01

EX. 300mmø CONC. ENCASED PVC UTILITY DUCT

EXISTING 50.0m 375mmø CONC. STM @ 1.02% (APPROX.)

EX. SAN INV. 307.19

EX. T&EV

EXISTING ASPHALT DRIVEWAY

EX. STMMH T/G 310.29 NE INV. 307.70 SW INV. 307.74

EX. STMMH T/G 309.64 NE INV. 309.64

EXISTING 50.0m 300mmø CONC. STM @ 1.26% (APPROX.)

EX. SANMH SAB05108 T/G 310.94 N INV. 307.11 S INV. 307.12

EXISTING 75.0m 250mmø PVC SAN SEWER @ 0.90% (APPROX.)

EX. SANMH SAB05109 T/G 310.06 N INV. 306.38 S INV. 306.43

EXISTING CURB CUT

EXISTING EDGE OF PAVEMENT

EXISTING 87.5m 250mmø PVC SAN SEWER @ 0.50% (APPROX.)

EX. 300mmø CONC. ENCASED PVC UTILITY DUCT

EXISTING SIDEWALK

EXISTING EDGE OF PAVEMENT

EXISTING EDGE OF PAVEMENT (APPROX.)

O/H WIRES

EXISTING BELL PEDESTAL

EXISTING RETAINING WALL

EX. SAN MH 307.51

EXISTING ASPHALT DRIVEWAY

SUBJECT TO AN EASEMENT AS IN INST NO. IN31739

PART 1 PLAN 51R-17476

PART 1 PLAN 51R-12549

EX. SAN INV. 306.61

EX. SAN INV. 306.57

48.29

N43°45'17"E

13.80

N35°40'11"E

IB

SIB

EXISTING EXPOSED AGGREGATE

EXISTING GRAVEL DRIVEWAY

EXISTING SHRUBS

EXISTING SHRUBS

#386 EXISTING SINGLE STOREY RESIDENTIAL DWELLING

PLAN

PIN 58733 -0977 (LT)

PART 2 PLAN 51R-17476

PIN 58733 -1033

PART 2 PLAN 51R-12549

PART 3 PLAN 51R-12549

EXISTING PORCH

#390 EXISTING 2 STOREY RESIDENTIAL DWELLING

EXISTING GRAVEL DRIVEWAY

EXISTING SHED

EXISTING DECK

EXISTING BARN

EXISTING SHED

ORIGINAL ROAD ALLOWANCE BETWEEN LOTS 5 & 6 (VETERANS DRIVE BY BY-LAW 71-80,INST NO. 756484) (CLOSED BY BY-LAW 2002-129 INST. SC24459)

PIN 58733 -0864

PIN 58733 -0383 (LT)

PART 1 PLAN 51R-26848

PART 3 PLAN 51R-26848

N10°47'25"W

34.12

N10°47'46"W

46.13

REGISTERED

PART 8 PLAN 51R-32052

PART 9 PLAN 51R-32052

10.36

N85°50'35"E

SIB

13.11

SHED

SHED

39.81

N85°50'35"E

PART 10 PLAN 51R-26906

PIN 58733 -0254

LOT 19

SIB

EXISTING FENCE

34.67

N47°24'22"E

SHED

PIN 58733 -0216

PART 9 PLAN 51R-26906

LOT 23

PART 1 PLAN 51R-27692

PIN 58733 -0266

LOT 22

PIN 58733 -0267

PART 2 PLAN 51R-27692

PART 8 PLAN 51R-26906

PIN 58733 -0214

LOT 21

PART 7 PLAN 51R-26906

PIN 58733 -0265

LOT 20

LOT 18

49.85

N42°17'00"W

IB

SIB

5.22

N44°50'13"W

SIB

LEGEND

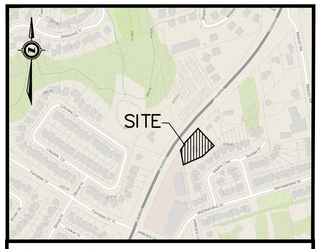
- SITE BOUNDARY
- ×000.00 EXISTING ELEVATION
- 000.00 MAJOR CONTOUR LINE
- 000.00 MINOR CONTOUR LINE
- STANDARD IRON BAR
- EXISTING EDGE OF PAVEMENT
- EXISTING CONCRETE CURB
- EXISTING SANITARY SEWER
- EXISTING SANITARY MANHOLE
- EXISTING STORM SEWER
- EXISTING CATCHBASIN
- EXISTING STORM MANHOLE
- EXISTING WATERMAIN
- EXISTING HYDRANT
- GAS GAS EXISTING GAS MAIN
- BCU BCU EXISTING BELL CANADA UNDERGROUND WIRE
- OH OH EXISTING OVERHEAD CABLE
- EXISTING BUILDING FOOTPRINT
- EXISTING GRAVEL DRIVEWAY
- EXISTING ASPHALT DRIVEWAY
- EXISTING DECIDUOUS TREE
- EXISTING CONIFEROUS TREE
- OUTBOUND FLOW

PINESTONE ENGINEERING LIMITED | www.pel.ca

The position of existing above ground and underground utilities and facilities are not necessarily shown on the drawings, and where shown, the accuracy of the position of such utilities and facilities is not guaranteed. Before starting work, the contractor shall confirm the exact location of all existing utilities and facilities, and shall assume all liability for damage to them

Drawings shall not be used for construction unless sealed and signed. All work to be performed in accordance with the Occupational Health & Safety Act 1990.

Any errors and/or omissions shall be reported to Pinestone Engineering Ltd. without delay.



KEY MAP

NOTES

1. TOPOGRAPHIC SURVEY COMPLETED BY A. AZIZ SURVEYORS INC. MAY 19th, 2017
2. LEGAL INFORMATION PROVIDED BY A. AZIZ SURVEYORS INC.
3. SITE PLAN PROVIDED BY ACK ARCHITECTS INC.

BENCHMARK

BM#1 CITY OF BARRIE BENCHMARK #03120030023
ELEVATION 303.861

NO.	YY.MM.DD	REVISION	BY

SEAL

NORTH ARROW

DESIGN BY:	J.V.
DRAWN BY:	A.L.
CHECKED BY:	J.V.
DATE:	AUGUST 2018
SCALE:	1:200

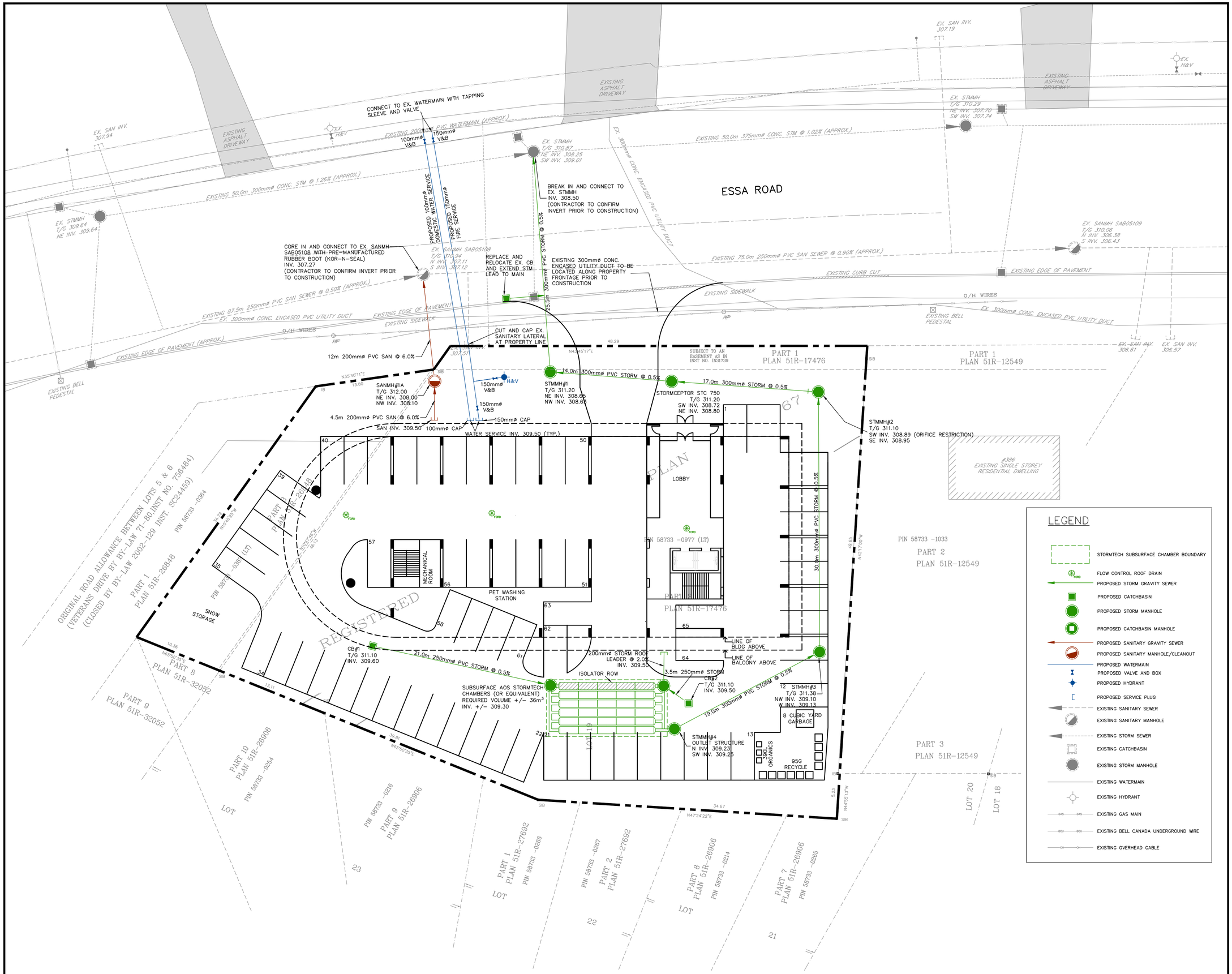
CLIENT/PROJECT

390 ESSA ROAD MIDRISE DEVELOPMENT

DRAWING TITLE

EXISTING CONDITIONS PLAN

PROJECT NO.	DRAWING NO.	REVISION
17-11346-B	EX-1	0



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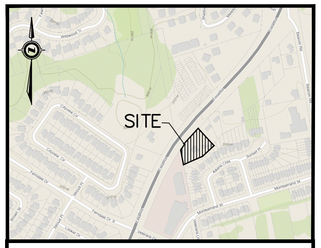
The position of existing above ground and underground utilities and facilities are not necessarily shown on the drawings, and where shown, the accuracy of the position of such utilities and facilities is not guaranteed. Before starting work, the contractor shall confirm the exact location of all existing utilities and facilities, and shall assume all liability for damage to them

Drawings shall not be used for construction unless sealed and signed. All work to be performed in accordance with the Occupational Health & Safety Act 1990.

Any errors and/or omissions shall be reported to Pinestone Engineering Ltd. without delay.



KEY MAP

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LEGEND

- STORMTECH SUBSURFACE CHAMBER BOUNDARY
- FLOW CONTROL ROOF DRAIN
- PROPOSED STORM GRAVITY SEWER
- PROPOSED CATCHBASIN
- PROPOSED STORM MANHOLE
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED SANITARY GRAVITY SEWER
- PROPOSED SANITARY MANHOLE/CLEANOUT
- PROPOSED WATERMAIN
- PROPOSED VALVE AND BOX
- PROPOSED HYDRANT
- PROPOSED SERVICE PLUG
- EXISTING SANITARY SEWER
- EXISTING SANITARY MANHOLE
- EXISTING STORM SEWER
- EXISTING CATCHBASIN
- EXISTING STORM MANHOLE
- EXISTING WATERMAIN
- EXISTING HYDRANT
- EXISTING GAS MAIN
- EXISTING BELL CANADA UNDERGROUND WIRE
- EXISTING OVERHEAD CABLE

BENCHMARK

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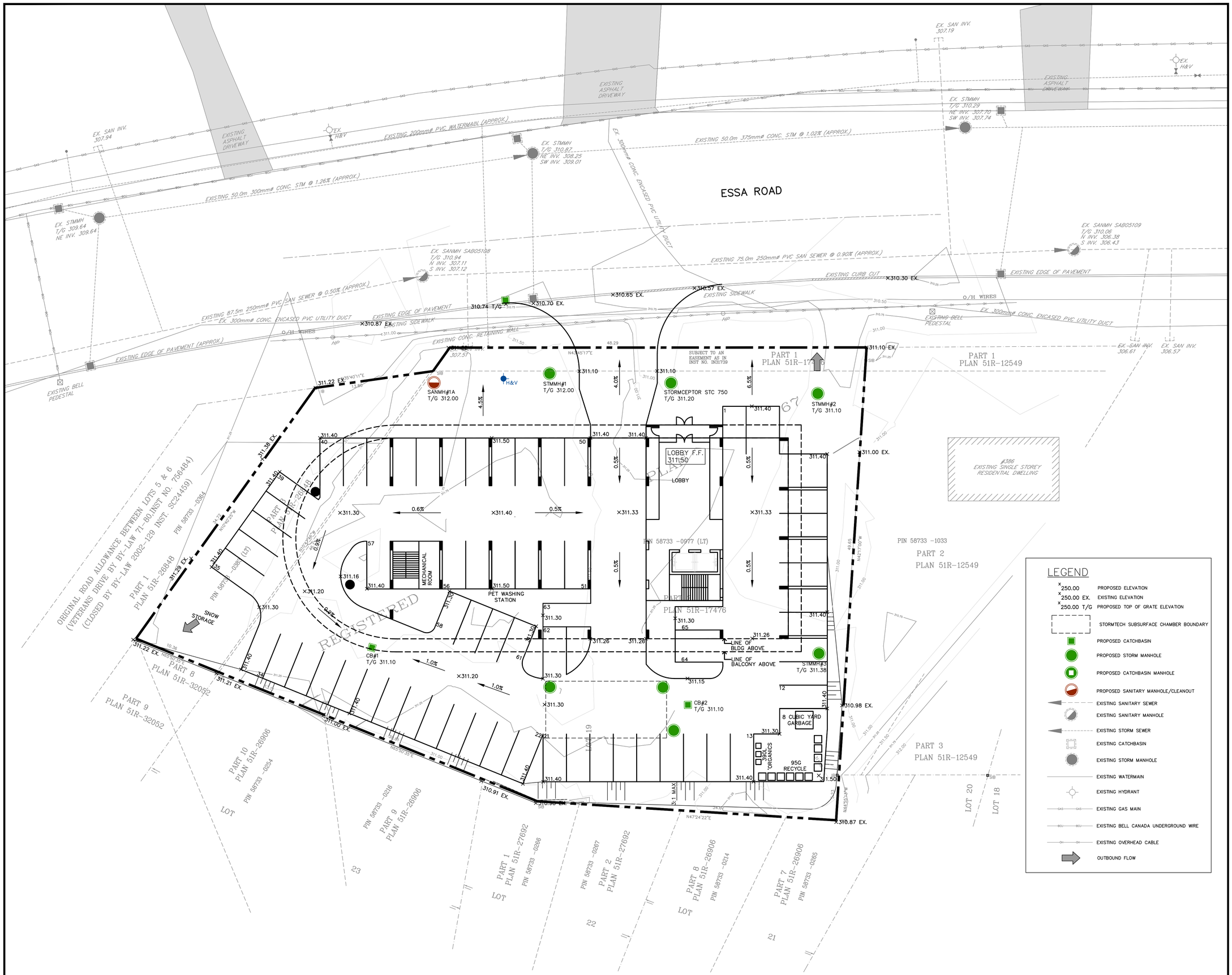
CLIENT/PROJECT

390 ESSA ROAD
MIDRISE DEVELOPMENT

DRAWING TITLE

CONCEPTUAL SERVICING PLAN

PROJECT NO.	DRAWING NO.	REVISION
17-11346-B	G	0



LEGEND

- PROPOSED ELEVATION
- EXISTING ELEVATION
- PROPOSED TOP OF GRATE ELEVATION
- STORMTECH SUBSURFACE CHAMBER BOUNDARY
- PROPOSED CATCHBASIN
- PROPOSED STORM MANHOLE
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED SANITARY MANHOLE/CLEANOUT
- EXISTING SANITARY SEWER
- EXISTING SANITARY MANHOLE
- EXISTING STORM SEWER
- EXISTING CATCHBASIN
- EXISTING STORM MANHOLE
- EXISTING WATERMAIN
- EXISTING HYDRANT
- EXISTING GAS MAIN
- EXISTING BELL CANADA UNDERGROUND WIRE
- EXISTING OVERHEAD CABLE
- OUTBOUND FLOW

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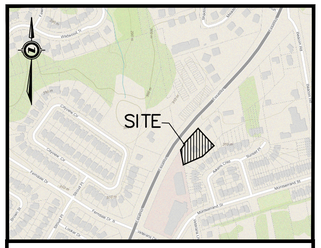

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CLIENT/PROJECT

390 ESSA ROAD
MIDRISE DEVELOPMENT

DRAWING TITLE

CONCEPTUAL GRADING PLAN

PROJECT NO.	DRAWING NO.	REVISION
17-11346-B	GP-1	0