Functional Servicing Report

Sean Mason Homes (Vet Lane Inc.)
339 Veteran's Drive
& 341 Veteran's Lane

City of Barrie
County of Simcoe

PEARSON
ENGINEERING LTD.
PEARSONENG.COM

October 2019
18079

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Functional Servicing Report

339 Veteran's Dr. & 341 Veteran's Lane, Barrie

1. Introduction

PEARSON Engineering Ltd. has been retained by Sean Mason Homes (Vet Lane Inc.) (Client) to prepare a Functional Servicing Report in support of the proposed residential development at 335 Veteran's Drive and 341 Veteran's Lane (Project) located on the east and west sides of Veteran's Lane in the City of Barrie (City). The subject lands are located north of Veteran's Drive and south of Montserrand Street and can be seen on Figure 1.

The Project site consists of two parcels of land separated by Veteran's Lane with a combined area of approximately 0.91 ha in size. The east parcel has an existing house and the west parcel is an undeveloped lot. The east parcel drains from west to east across the adjacent residential properties and is bound by Veteran's Lane to the west and existing single detached residential homes to the north, east and south. The west triangular parcel drains from south to north towards Montserrand Street and is bound by Veteran's Drive to the south, Montserrand Street to the west and north and Veteran's Lane to the east. The Project proposes the development of the site through the construction of a walk-up 24-plex unit on the west property and 33 townhouse units on the east property.

This Report assesses the existing municipal infrastructure in the vicinity of the Project and the onsite Stormwater Management (SWM) facilities and internal services required to service the proposed Project. The report also includes preliminary design calculations and a brief outline of the proposed internal services, as well as comments regarding the ability of the various secondary utilities to service the site.

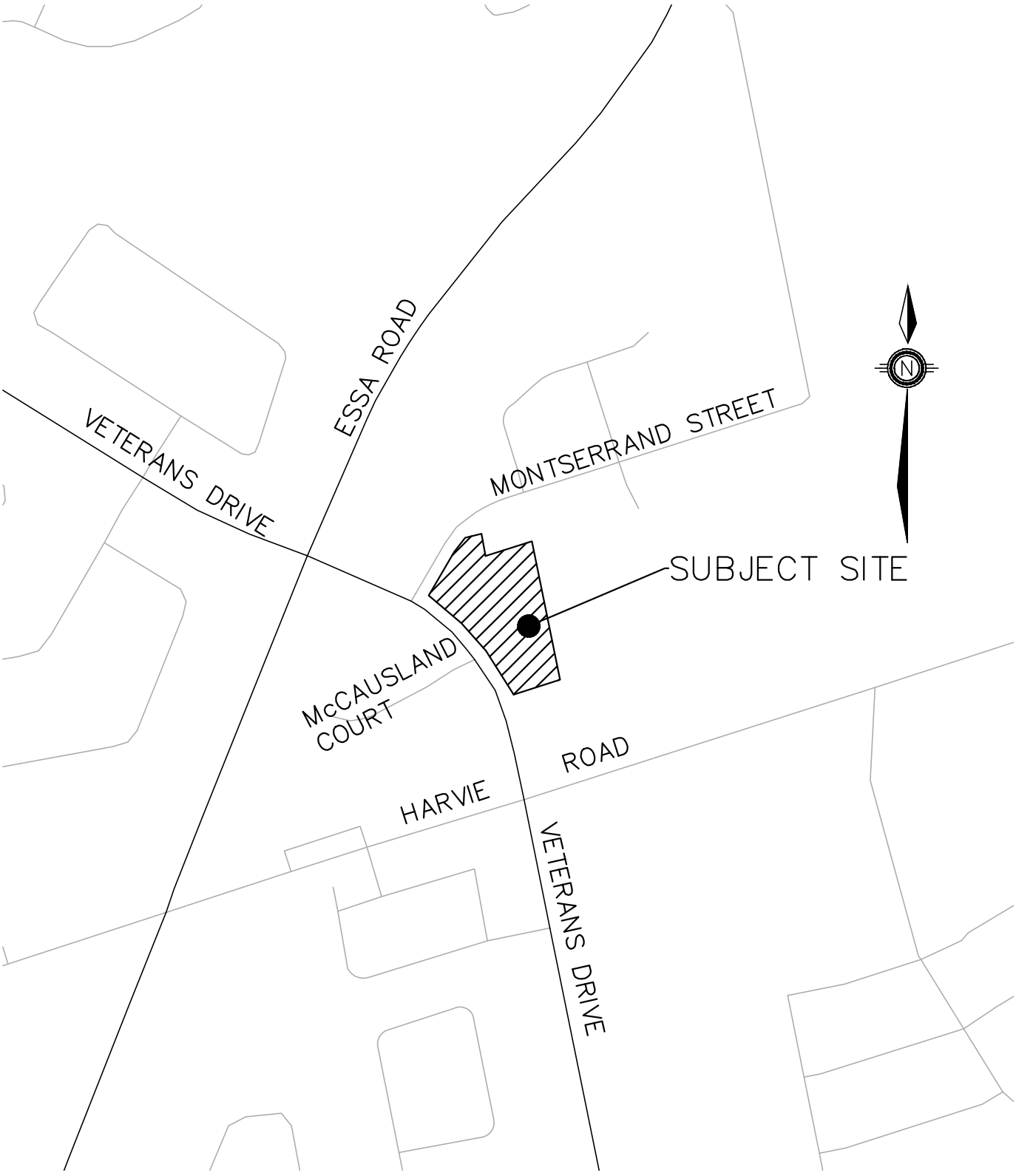
2. Supporting Documents

The following documents have been referenced in the preparation of this report:

- Ministry of the Environment, Design Guidelines for Sewage Works – 2008
- Ministry of the Environment, Design Guidelines for Drinking-Water Systems - 2008
- Ministry of the Environment, Stormwater Management Planning and Design Manual, March 2003
- City of Barrie, Sanitary Sewage Collection System Policies and Design Guideline
- City of Barrie, Storm Drainage and Stormwater Management Policies and Design Guidelines.

3. Design Population

The proposed development is to consist of a walk-up 24-plex as well as 33 townhouses divided into 6 blocks. A population density of 2.34 ppu has been used for the project resulting in a design population of approximately 133 persons.



SEAN MASON HOMES
VET. LANE INC.
BARRIE, ON

SITE LOCATION PLAN

PEARSON ENGINEERING LTD.
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	AMC	HORIZ SCALE	NTS	PROJECT #	18079
DRAWN BY	AMC	VERT SCALE	NTS	DRAWING #	FIG-1
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4. Water Supply and Distribution

4.1. Water Servicing Design Criteria

The site is to have a total design population of 133 persons. Utilizing the City of Barrie Guidelines for domestic water use of 225 L/capita/day the required Average Day Demand (ADD) is 0.35 L/sec. A Peak Rate factor of 4.13 was used for the development resulting in a Peak Hour Demand of 1.43 L/sec for the development. Calculations for the domestic water requirements for the site can be found in Appendix A.

4.2. Internal Water Distribution System

The townhouse units domestic water service will be supplied from the existing 200 mm diameter watermain located on the south side of the Montserrand Street right of way. A new 150 mm diameter domestic service will be brought into the site to service the proposed townhouses, reducing to a 100 mm diameter service after the fire hydrant location. The proposed 150 mm service will enter the site along Veteran's Lane and then come up into the east block along the proposed driveway and loop between Townhouse Block 2 and 3. A 25 mm diameter service is to be provided for a domestic water connection to each townhouse unit separately. A 100 mm diameter domestic water service will be supplied to the 24-plex from the proposed 150 mm watermain on Veteran's Lane. Refer to Figure 2 for the domestic water service layout.

5. Sanitary Servicing

5.1. Sanitary Design Criteria

The site is to have a total design population of 133 persons. Utilizing the City of Barrie flow value for domestic sewer use of 225 L/capita/day, an Average Daily Demand (ADD) of 0.35 L/s was calculated. Using a Peaking Factor of 4.0 for this project and an infiltration allowance of 0.21 L/s, a peak flow of 1.60 L/sec was calculated for the entire development. The proposed 250 mm diameter sanitary sewer has a capacity of 26.6 L/s at 0.5%. The downstream existing sanitary sewer on Montserrand Street has a diameter of 300 mm and a capacity of 53 L/s at 0.3%. As the peak flow from the development is approximately 3% of the total capacity of the existing sewer, it is expected to be sufficient to convey the sanitary design flows from the proposed development. Sanitary design flow calculations can be found in Appendix B.

5.2. Sanitary Sewer System

A proposed 200 mm diameter sanitary sewer will tie into the existing stub at the intersection of Veteran's Lane and Montserrand Street and extend into the eastern property in order to service the townhouse units which will all be provided with a 100 mm service. The proposed 24-plex will connect to the proposed sanitary sewer on Veteran's Lane with a 200 mm diameter sewer. The proposed sanitary sewer system for the site can be seen on Figure 3.

6. Stormwater Management

A key component of the development is the need to address environmental and related SWM issues. These are examined in a framework aimed at meeting the City, Lake Simcoe Region Conservation Authority (LSRCA) and Ministry of the Environment, Conservation and Parks (MECP) requirements. SWM parameters have evolved from an understanding of the location and sensitivity of the site's natural systems. This FSR focuses on the necessary measures to satisfy the MECP's SWM requirements.

GRADE FROM PROPOSED
PROPERTY LINE INTO EXISTING
GRADES AT MAX 3:1 SLOPE

BLOCK 4
5 UNITS

BLOCK 5
5 UNITS

BLOCK 6
5 UNITS

BLOCK 1
6 UNITS

BLOCK 2
6 UNITS

BLOCK 3
6 UNITS

PROP. 150mmø WATERMAIN

PROP. 150mmø WATERMAIN

PROP. 150mmø WATERMAIN

PROP. 150mmø WATERMAIN

PROP. 150mmø WATERMAIN

H&V

VB

VB

EX. BOARD FENCE

EX. 450mmø CULVERT
TO BE REMOVED

R12

R12

R12

R12

9

8

15

ONE-WAY

EX EDGE OF PAVEMENT

CONCRETE SIDEWALK

BACK OF CURB

EDGE OF PAVEMENT

VETERANS LANE

GARBAGE

TF

4 STOREY
WALK-UP
24-PLEX
602.5m²

2.00m

EX. 200mø PVC W/M

EX. 300mm PVCø W/M

EX H&V

VETERANS DRIVE

MONTSERRAND STREET

PROP.
RETAINING
WALL

KEY PLAN
NTS

ESSA ROAD

VETERANS DRIVE

MONTSERRAND STREET

SUBJECT SITE

McCAULSLAND COURT

HARVIE ROAD

VETERANS

N

LEGEND

- SITE BOUNDARY
- H&V — FIRE HYDRANT
- WATER VALVE
- WATERMAIN

NO.	REVISION NOTE	DATE	BY

SEAN MASON HOMES
VET. LANE INC.
BARRIE, ON

WATER SERVICING PLAN

PEARSON ENGINEERING LTD.
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	AMC	HORIZ SCALE 1:500	PROJECT # 18079
DRAWN BY	AMC	VERT SCALE	DRAWING # FIG-2
CHECKED BY	MWD	DATE APRIL 2019	REVISION # 0

GRADE FROM PROPOSED
PROPERTY LINE INTO EXISTING
GRADES AT MAX 3:1 SLOPE

BLOCK 4
5 UNITS

BLOCK 5
5 UNITS

BLOCK 6
5 UNITS

BLOCK 1
6 UNITS

BLOCK 2
6 UNITS

BLOCK 3
6 UNITS

MH1

MH2

MH3

MH4

MH5

PROP. 200mmø SAN.

PROP. 200mmø SAN.

PROP. 200mmø SAN.

PROP. 200mmø SAN.

PROP.
RETAINING
WALL

EX. BOARD FENCE

EX. 20.0m – 200mmø
SAN. @ 2.15%

EX. SAN. PLUG
INV. 307.21
INV. 307.01

GARBAGE

EX. 43.4m – 300mmø SAN. @ 0.20%

EX. 42.2m – 300mmø SAN. @

ONE-WAY

EX EDGE OF PAVEMENT

CONCRETE SIDEWALK

BACK OF CURB

EDGE OF PAVEMENT

VETERANS LANE

VETERANS DRIVE

MONTSERRAND STREET

4 STOREY
WALK-UP
24-PLEX
602.5m²

2.00m

ESSA ROAD

VETERANS DRIVE

MONTSERRAND STREET

SUBJECT SITE

McCAULSLAND COURT

HARVIE ROAD

VETERANS

KEY PLAN
NTS

LEGEND

- SITE BOUNDARY
- MH — EX SANITARY MANHOLE
- SAN MH — PROP SANITARY MANHOLE
- SANITARY SEWER

NO.	REVISION NOTE	DATE	BY

SEAN MASON HOMES
VET. LANE INC.
BARRIE, ON

SANITARY SERVICING PLAN

PEARSON ENGINEERING LTD.
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	AMC	HORIZ SCALE	1:500	PROJECT #	18079
DRAWN BY	AMC	VERT SCALE		DRAWING #	FIG-3
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It is understood the objectives of the SWM plan are to:

- Protect life and property from flooding and erosion
- Maintain water quality for ecological integrity, recreational opportunities etc.
- Protect and maintain groundwater flow regime(s).
- Protect aquatic and fishery communities and habitats.
- Maintain and protect significant natural features.

6.1. Analysis Methodology

The design of the SWM Facilities for this site has been conducted in accordance with:

- The Ministry of the Environment Stormwater Management Planning and Design Manual, March 2003
- City of Barrie, Storm Drainage and Stormwater Management Policies and Design Guidelines – December 2017
- Lake Simcoe Region Conservation Authority Technical Guidelines for Stormwater Management Submissions, September 2016

6.2. Existing Conditions

The existing Project site is comprised of an existing residential lot on the east side of Veteran's Lane and a vacant pasture area to the west. Topographic survey of the site identifies that the west parcel drains from south to north towards Montserrand infrastructure and the east parcel drains from west to east via overland flow. Details of existing drainage conditions are shown on Figure 4.

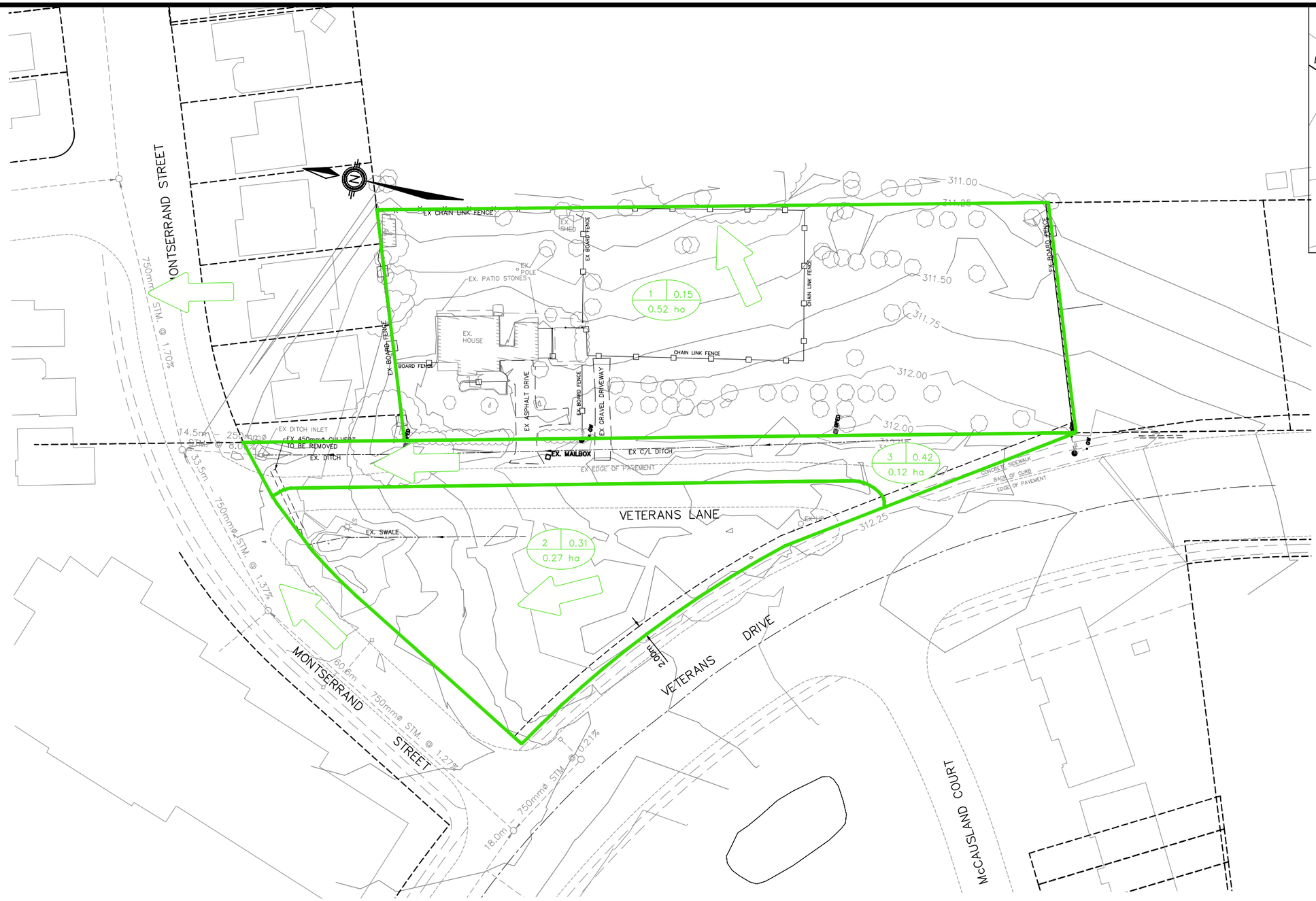
According to the drawing "Beacon Road Subdivision – Storm Drainage Area Plan" completed by RG Robinson dated December 1995, the east parcel has been included in a catchment area of 4.51 ha with a runoff coefficient of 0.45 that drains overland towards an existing outfall to the watercourse north of Harvie Road and east of Beacon Road. The remainder of the site including Veteran's Lane can be found on the "Essa/Ferndale Development – Storm Drainage Area Plan" completed by RG Robinson dated April 1996 with coefficients from 0.60 to 0.85 that have been included in the design of the storm sewer on Montserrand Street which ultimately drains to the same watercourse.

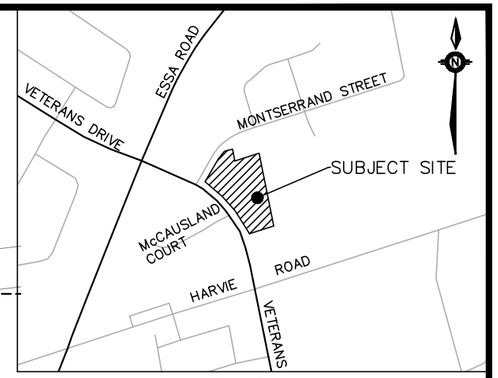
According to the Geotechnical Investigation completed by Soil Engineers Ltd. dated June 2019, the majority of the project site is comprised of Silty Sand Till with a layer of Silt on the western property. The Silty Sand Till is a frictional soil with relatively low permeability with an estimated coefficient of permeability of 10^{-5} to 10^{-6}.

Allowable peak flows for the site were calculated using the site's current conditions and can be seen in Table 1 below. Detailed calculations for the existing drainage conditions can be found in Appendix C.

Table 1: Pre-Development Peak Flows (m^3/s)

	2 year	5 year	10 year	25 year	50 year	100 year
Total Site Peak Flow (m^3/s)	0.05	0.07	0.08	0.10	0.13	0.14





KEY PLAN
NTS

LEGEND

- SITE BOUNDARY
- OVERLAND FLOW DIRECTION
- CATCHMENT AREA (1 | 0.75 | 1.00 ha) RUNOFF COEFFICIENT
- AREA IN HECTARES
- CATCHMENT BOUNDARY

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SEAN MASON HOMES
VET. LANE INC.
BARRIE, ON

PRE-DEVELOPMENT STORM DRAINAGE PLAN

PEARSON ENGINEERING LTD.
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	AMC	HORIZ SCALE	1:750	PROJECT #	18079
DRAWN BY	AMC	VERT SCALE		DRAWING #	FIG-4
CHECKED BY	MWD	DATE	APRIL 2019	REVISION #	0

6.3. Proposed Storm Drainage System

The post development drainage for the development will generally follow pre-development conditions. The majority of the eastern property will drain towards the proposed road which will be designed with rain gardens located between the townhouse driveways. The rain gardens will be designed to provide storage volume for the 25 mm storm over the catchment's impervious area. A portion of the rooftop area of Townhouse Block 4 will drain via roof leader to an underground infiltration gallery located north of Block 4 adjacent to the property line. In the event of a storm greater than the 25 mm storm, the rain gardens will surcharge conveying storm runoff to a catchbasin and storm sewer system sized to the convey the minor storm, defined as all storm events up to the 5 year storm. The storm sewer will then cross Veteran's Lane to the triangular western property.

The western property's parking lot will drain to the storm sewer system. The downspouts from the rooftop area of the proposed 24-plex will be conveyed to a surface infiltration gallery sized for the 25 mm storm. The site has been graded to convey any excess runoff towards the storm sewer system. The storm sewer will ultimately be conveyed northerly to the existing ditch inlet catchbasin at the intersection of Veteran's Lane and Montserrand Street.

In the event of a major storm, defined as any storm event greater than the 5 year storm, the proposed storm sewer will surcharge, forcing stormwater to the surface. The proposed road through the eastern property has been graded to provide an overland flow route northerly through the right-of-way towards Veteran's Lane. A curb cut along the western side of Veteran's Lane will allow stormwater to flow to the western property's parking lot. An overland flow route for the project will be then be provided through the western property's driveway entrance towards the Veteran's Lane right of way, ultimately draining to Montserrand Street. Post development storm drainage patterns are shown on Figure 5.

An analysis of the existing storm sewer on Montserrand Street was completed to ensure sufficient capacity was available for the Project. Using as-built storm catchment plans for the area, a storm sewer design sheet was created and it was determined that significant portions of the downstream sewer system is currently over capacity. This can be attributed to the fact that the storm sewer was designed in 1995 using smaller IDF curves than the current City of Barrie standards. The nominal increase in peak flows from the development is not expected to impact the existing storm sewer. The storm sewer design sheet can be seen in Appendix C.

As detailed in the following sections, the site is proposed to be designed with low impact development features such as rain gardens, rooftop infiltration, and permeable pavers to meet various criteria for the Project's regulatory authorities. The 24-plex building will drain to a surface infiltration gallery sized to infiltrate the 25 mm storm, resulting in a storage volume of 15 m^3. Similarly, the rain gardens on the eastern property will be designed to provide storage for the 25 mm storm for a volume of 75 m^3. Permeable pavers located in the parking stalls along Veteran's Lane as well as the parking lot on the western property will be designed with a storage volume of 60 m^3, for a total site storage of 150 m^3.

6.4. Stormwater Quantity Control

The proposed development will increase the imperviousness of the site and as such the post-development peak flows will increase. Quantity controls will be implemented to attenuate the increase in runoff prior to leaving the site.

To account for the increased runoff, the post development peak flow from both properties will be reduced such that they do not exceed the pre-development peak flows through the use of underground storage chambers and an orifice tube. Quantity control storage will be provided below the parking area on the western property with a storage volume of 201 m^3 in order to reduce the peak flows leaving the site.

GRADE FROM PROPOSED PROPERTY LINE INTO EXISTING GRADES AT MAX 3:1 SLOPE

BLOCK 4 5 UNITS

BLOCK 5 5 UNITS

BLOCK 6 5 UNITS

BLOCK 1 6 UNITS

BLOCK 2 6 UNITS

BLOCK 3 6 UNITS

4.00m

ROOFTOP INFILTATION TANKS

PROP. PERFORATED SUBDRAIN

PROP. STM. PIPE

CBMH2

CBMH3

MH3

PROP. RETAINING WALL

EX. BOARD FENCE

CONNECT INTO EX. DITCH INLET

EX DITCH INLET

EX 450mmø CULVERT TO BE REMOVED

PROP. STM. PIPE

PROP. STM. PIPE R12

R12

1 | 0.69
0.84ha

2 | 0.52
0.08ha

MH1

MH2

STM. PIPE

ONE-WAY

EX EDGE OF PAVEMENT

CONCRETE SIDEWALK

BACK OF CURB

EDGE OF PAVEMENT

VETERANS LANE

GARBAGE

CBMH1

STM QUANTITY CONTROL TANKS
BRENTWOOD STORMTANK ST-36
175m³ IN TANKS AND 25m
ON THE SURFACE
INV. 309.00

4 STOREY WALK-UP 24-PLEX 602.5m²

20.0m

VETERANS DRIVE

MONTSERRAND STREET

60.6m - 750mmø STM. @ 1.27%

750mmø STM. @ 1.37%

@ 0.21%

ESSA ROAD

VETERANS DRIVE

MONTSERRAND STREET

SUBJECT SITE

McCAULSLAND COURT

HARVIE ROAD

VETERANS

KEY PLAN
NTS

LEGEND

- SITE BOUNDARY
- OVERLAND FLOW DIRECTION
- CATCHMENT AREA: 1 | 0.75 | 1.00 ha — RUNOFF COEFFICIENT; AREA IN HECTARES
- CATCHMENT BOUNDARY

NO.	REVISION NOTE	DATE	BY

SEAN MASON HOMES
VET. LANE INC.
BARRIE, ON

POST DEVELOPMENT STORM DRAINAGE PLAN

PEARSON ENGINEERING LTD.
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	AMC	HORIZ SCALE	1:500	PROJECT #	18079
DRAWN BY	AMC	VERT SCALE		DRAWING #	FIG-5
CHECKED BY	MWD	DATE	APRIL 2019	REVISION #	0

Table 2 below summarizes post-development peak flows for the development. By comparing Table 1 and Table 2, it can be seen that the post development peak flow for the site are smaller than pre development for all storm events. Detailed quantity control calculations can be seen in Appendix C.

Table 2: Post Development Peak Flows

	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)
Controlled Flow (m^3/s)	0.04	0.06	0.07	0.09	0.10	0.12
Uncontrolled Flow (m^3/s)	0.01	0.01	0.01	0.02	0.02	0.03
Total Site Peak Flow (m^3/s)	**0.05**	**0.07**	**0.08**	**0.10**	**0.13**	**0.14**

6.5. Stormwater Quality Control

The Ministry of the Environment, Conservation and Parks (MECP) in March 2003 issued a "Stormwater Management Planning and Design Manual". This manual has been adopted by a variety of agencies including the City of Barrie. The Stormwater Quality Control objective will be to ensure Enhanced Protection quality control as stated in the MECP manual. To achieve enhanced protection, permanent and temporary control of erosion and sediment transport are proposed.

The development's roadways and parking facilities pose a risk to stormwater quality through the collection of grit, sand and oils on the paved surface. Various LID features will be implemented throughout the site which will be designed to provide quality control for the site.

Using Table 3.2 from the MECP SWM Guidelines, an infiltration storage volume of 30.8 m^3 is required to treat the storm water released from this site to the MECP's Enhanced Protection standard. This standard stipulates a Total Suspended Solids (TSS) removal of at least 80%. Detailed calculations can be found within Appendix C.

However, it is proposed to provide storage equivalent to the 25 mm storm to meet the LSRCA's volume control requirements, resulting in a total required volume of 149 m^3 for the development. The rain gardens, surface infiltration galleries, and permeable pavers will be designed with a combined storage volume of 149 m^3, satisfying this criteria. Refer to calculations in Appendix C.

During construction, earth grading and excavation will create the potential for soil erosion and sedimentation. It is imperative that effective environmental and sedimentation controls are in place and maintained throughout the duration of construction activities to ensure stormwater runoff's quality.

Therefore, the following recommendations shall be implemented and maintained during construction to achieve acceptable stormwater runoff quality:

- Installation of silt fence along the entire perimeter of the site to reduce sediment migration onto surrounding properties.
- Installation of a construction entrance mat to minimize transportation of sediment onto roadways.
- Restoration of exposed surfaces with vegetative and non-vegetative material as soon as construction schedules permit, the duration of which is not to exceed 30 days.
- Reduce stormwater drainage velocities where possible.
- Minimize the amount of existing vegetation removed.

6.6. Volume Control

As the project site meets the definition of Major Development as per LSRCA Guidelines, considerations were taken to meet the volume control criteria detailed in section 2.2.2. The LSRCA guidelines state that the 25 mm over the impervious area of the site is to be retained and treated, with flexible alternatives if this criteria cannot be met.

Therefore it is proposed to provide on-site storage to achieve a combination of infiltration and filtration of the 25 mm storm event over the impervious area of each catchment area, which results in a total volume of approximately 149 m^3. Approximately 75 m^3 of infiltration will be provided in the proposed rain gardens, with an additional 15 m^3 in the surface infiltration gallery for the 24-plex building if soil conditions and groundwater elevation permits. The remaining 60 m^3 will be provided via filtration through proposed permeable pavers along Veteran's Lane and the parking lot on the western property. Detailed sizing calculations for the LID features will be completed at the detailed design stage.

6.7. Water Balance

Since the post development state will increase the imperviousness of the site, considerations were taken in regards to groundwater recharge. Under pre-development conditions, the project site had an annual recharge volume of 2,087 m^3. With the increased imperviousness of the site, this recharge will be reduced to 713 m^3, resulting in a deficit volume of 1,373 m^3.

In order to infiltrate the deficit of 1,373 m^3, storm runoff from the site will be conveyed to various infiltration facilities throughout the site. The east property will convey all storm runoff to rain gardens located between the townhouse unit driveways. The 24-plex building will drain to a proposed depressed grass infiltration facility which is sized to infiltrate the 25 mm storm from the rooftop area.

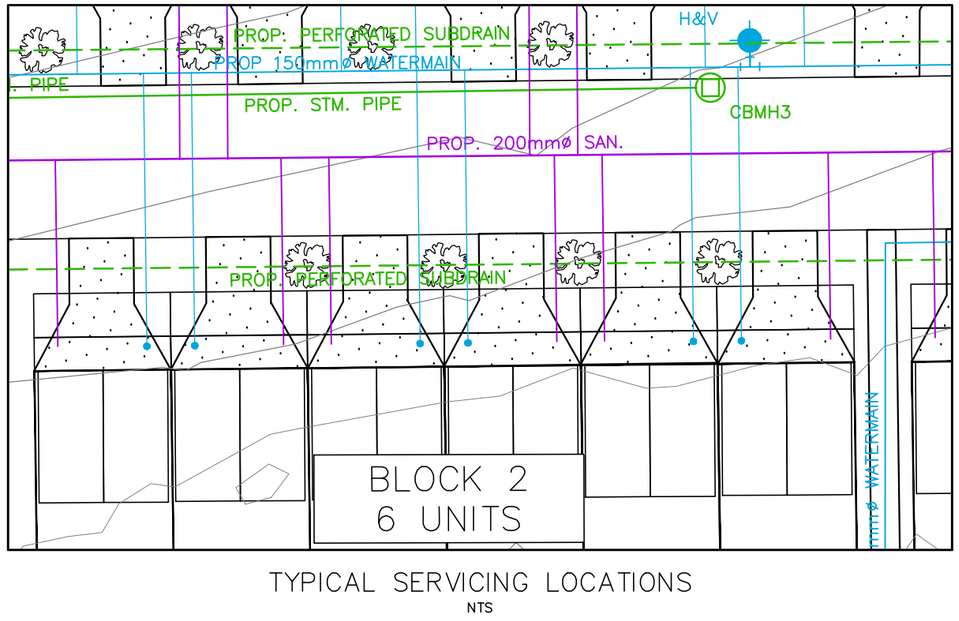
Water balance calculations demonstrate that 17 m^3 of infiltration is required in order to infiltrate the annual deficit of 1,373 m^3, however City of Barrie minimum criteria is 5 mm across the total development area resulting in a minimum volume of 46 m^3. The infiltration gallery for the 24-plex building has a storage volume of 15 m^3, and the rain gardens will be designed to provide the remaining 31 m^3 at the detailed design stage. Preliminary water balance calculations can be found in Appendix E.

6.8. Phosphorus

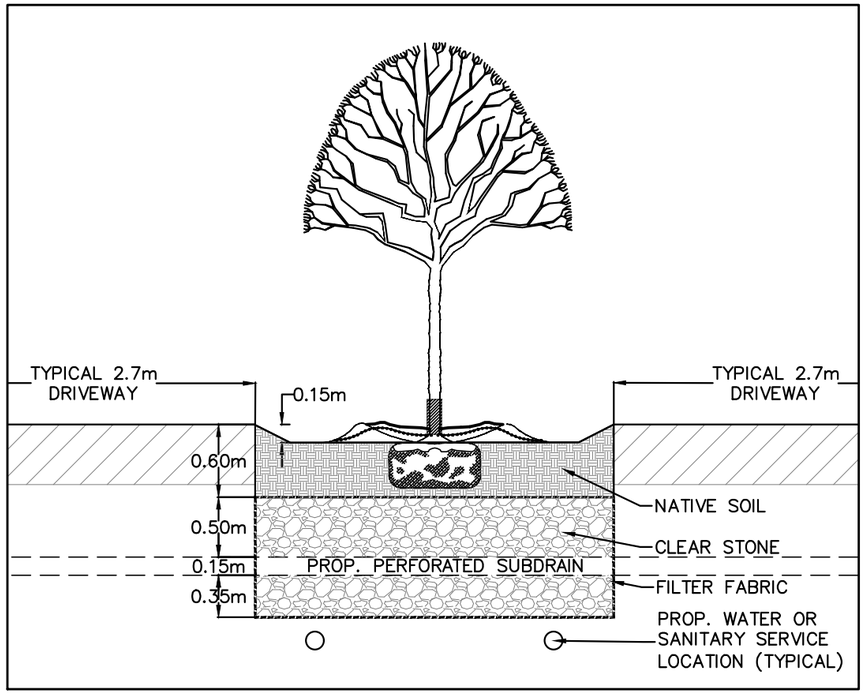
Local conservation authorities have determined the importance of reducing phosphorus levels in water courses in this area. As such, best efforts are to be employed in order to reduce phosphorus levels being contributed from the site.

The existing site generates approximately 0.21 kg of phosphorus annually and the proposed Project will generate approximately 1.21 kg of phosphorus annually if uncontrolled. Best efforts will be used in order to reduce the phosphorus loading as much as is reasonably possible.

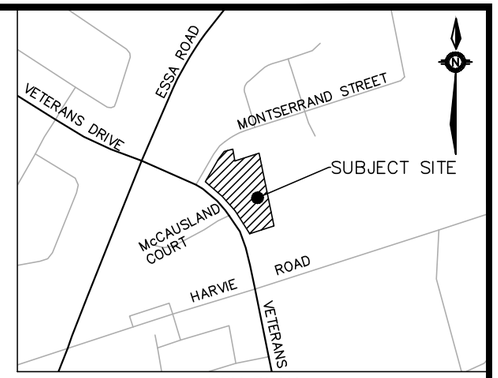
To minimize the amount of phosphorus discharged from the site, a treatment train approach is to be utilized. Rooftop runoff from the proposed townhouse units on the eastern property will be conveyed to splash pads via roof leader which will drain towards rain gardens between the townhouse driveways. Excess runoff will flow to the proposed road to a catchbasin system complete with 600 mm deep sediment sump to capture larger sediment particles. The parking lot for the 24-plex building on the western property will be constructed with permeable pavers allowing stormwater to filter through the stone reservoir prior to draining to the storm sewer system. The roof area from the 24-plex will be conveyed via roof leader to a surface infiltration gallery. The following Table 3 details the anticipated phosphorus loadings for the pre and post development conditions.



TYPICAL SERVICING LOCATIONS
NTS



LID TREEWELL DETAIL
NTS



KEY PLAN
NTS

LEGEND

- SITE BOUNDARY
- H&V — FIRE HYDRANT
- WATER VALVE
- WATERMAIN
- WATER SERVICE W. CURBSTOP
- SAN MH — PROP SANITARY MANHOLE
- SANITARY SEWER
- SANITARY SERVICE

NO.	REVISION NOTE	DATE	BY

SEAN MASON HOMES
VET. LANE INC.
BARRIE, ON

TYPICAL SERVICING AND LID DETAILS

PEARSON ENGINEERING LTD.
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	AMC	HORIZ SCALE	1:250	PROJECT #	18079
DRAWN BY	AMC	VERT SCALE		DRAWING #	FIG-6
CHECKED BY	MWD	DATE	APRIL 2019	REVISION #	0

GRADE FROM PROPOSED PROPERTY LINE INTO EXISTING GRADES AT MAX 3:1 SLOPE

BLOCK 4 5 UNITS

BLOCK 5 5 UNITS

BLOCK 6 5 UNITS

BLOCK 1 6 UNITS

BLOCK 2 6 UNITS

BLOCK 3 6 UNITS

PROP. RETAINING WALL

EX DITCH INLET

EX 450mmø CULVERT TO BE REMOVED

EX BOARD FENCE

EX CHAIN LINK FENCE

EX EDGE OF PAVEMENT

ONE-WAY

CONCRETE SIDEWALK

BACK OF CURB

EDGE OF PAVEMENT

VETERANS LANE

GARBAGE

4 STOREY WALK-UP 24-PLEX 602.5m²

MONTSERRAND STREET

VETERANS DRIVE

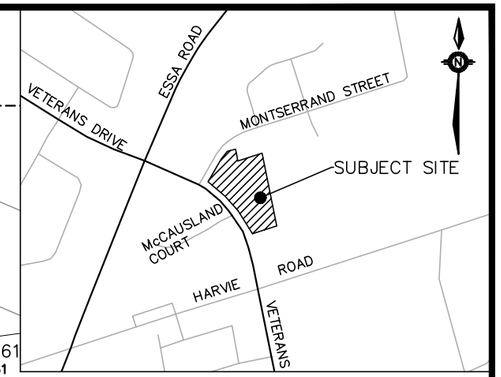
20.0m

1.2%

0.5%

R12

KEY PLAN
NTS



LEGEND

- SITE BOUNDARY
- ×254.63 / 254.09 — PROPOSED ELEVATION / EXISTING ELEVATION
- 1.5% — PROPOSED GRADE

NO.	REVISION NOTE	DATE	BY

SEAN MASON HOMES
VET. LANE INC.
BARRIE, ON

SITE GRADING PLAN

PEARSON ENGINEERING LTD.
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	AMC	HORIZ SCALE	1:500	PROJECT #	18079
DRAWN BY	AMC	VERT SCALE		DRAWING #	FIG-7
CHECKED BY	MWD	DATE	APRIL 2019	REVISION #	0

Table 3: Phosphorus Loadings

	Total P (kg)
Pre-Development	0.21
Uncontrolled Post Development	1.21
Controlled Post Development	0.48

Detailed calculations can be found in Appendix E.

7. Secondary Utilities

Letters have been sent to all secondary utilities to notify them of the proposed development, gain information on the availability of their services for the site and ensure they are able to adequately support the proposed development. Copies of these letters have been included in Appendix F.

8. Conclusions

The proposed development will require the connection of sanitary, storm and watermain services to the existing municipal services on Montserrand Street.

An LID treatment train approach is proposed to provide the required quality control to satisfy the MECP Enhanced level requirements. Underground storage chambers will be provide below the parking lot on the west property for quantity control.

Low impact development features will be implemented in order to achieve water balance requirements and reduce post development phosphorous loading for the site.

The analysis and conceptual design outlined in this report demonstrates that the servicing is feasible.

All of which is respectfully submitted,

Pearson Engineering Ltd.

Taylor Arkell, P. Eng
Project Engineer

Mike Dejean, P.Eng.
Manager of Engineering Services

Appendix A
Water Servicing Calculations

PEARSON ENGINEERING LTD.

Sean Homes - Veteran's Lane
Water Flow Calculations

Design Criteria

Demand per capita (Q):	225	L/cap/day
Peak Rate Factor (Max. Hour	4.13	(Table 3-1: Peaking Factors, MOE Design Guidelines for Drinking-Water Systems)
Max. Day Factor	2.75	(Table 3-1: Peaking Factors, MOE Design Guidelines for Drinking-Water Systems)

Site Data

Description	Density	Units	Flow Rate
Townhomes	2.34 person/unit	57 units	225 L/cap/d

Calculate Population

Pop.	=	2.34	x	57
Pop.	=	133	people	

Calculate Average Day Demand

ADD	=	225	x	133
ADD	=	30010.5	L/day	
ADD	=	0.35	L/s	

Calculate Max Day Flow

MDF	=	0.35	x	2.75
MDF	=	0.96	L/s	

Calculate Peak Hour Demand

PHD	=	0.35	x	4.13
PHD	=	1.43	L/s	

Appendix B
Sanitary Servicing Calculations

PEARSON ENGINEERING LTD.

Sean Homes - Veteran's Lane
Sanitary Flow Calculations

Design Criteria

Flow per capita (Q):	225	L/cap/day
Peak Flow	Qp = P * Q * M / 86400	
Peaking Factor (Harmon Formula)	M = 1 + (14 / (4 + (P / 1000) ^ 0.5))	2 <= "M" <= 4
Infiltration Allowance	0.23	L/ha/s

Site Data

Description	Density	Units	Flow Rate
Townhomes	2.34 person/unit	57 units	225 L/cap/d

Calculate Population

Pop. = 2.34 x 57

Pop. = 133 people

Calculate Average Daily Demand

$$ADD = \frac{225 \times 133}{86400}$$

ADD = 0.35 L/s

Calculate Peaking Factor

$$M = 1 + \frac{14}{4 + \left(\frac{133}{1{,}000}\right)^{0.5}}$$

M = 4.00

Infiltration Allowance = 0.23 x 0.91

= 0.21 L/s

Calculate Peak Flow

Qp = 0.35 x 4.00 + 0.21

= 1.60 L/s

Appendix C
Stormwater Management Calculations

PEARSON ENGINEERING LTD.

Sean Homes - Veteran's Lane
Calculation of Runoff Coefficients

Runoff Coefficient	=	0.15	0.95	0.95	0.08	0.95		Weighted
Surface Cover	=	Grass	Asphalt	Building	Forest	Conc.		Runoff Coefficient
Pre Development	Total Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)		
1	5238	4991	100	147	0	0		0.19
2	2692	2190	502	0	0	0		0.30
3	1218	808	410	0	0	0		0.42
Pre Total	9148	7989	1012	147	0	0		0.25
Post Development	Total Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)		
1	8366	2767	2315	2734	0	550		0.69
2	782	419	340	0	0	23		0.52
Post Total	9148	3186	2655	2734	0	573		0.67

Sean Homes - Veteran's Lane
Pre-Development Peak Flows

City of Barrie

Storm (yrs)	Coeff A	Coeff B	Coeff C
2	**678.09**	**4.70**	**0.78**
5	**853.61**	**4.70**	**0.77**
10	**975.87**	**4.70**	**0.76**
25	**1146.28**	**4.92**	**0.76**
50	**1236.15**	**4.70**	**0.75**
100	**1426.41**	**5.27**	**0.76**

Modified Rational Method
Q = CiCIA / 360

Where:

Q -	Flow Rate (m^3/s)
C -	Runoff Coefficient
I -	Storm Intensity (mm/hr)
A -	Area (ha.)
Ci -	Peaking Coefficient

Area Number	1 to 3	
Area	0.91	ha
Runoff Coefficient	0.25	
Time of Concentration	10	min
Return Rate	2	year
Peaking Coefficient (Ci)	1.00	
Rainfall Intensity	83.1	mm/hr
Pre Development Peak Flow	0.05	m^3/s

Return Rate	5	year
Peaking Coefficient (Ci)	1.00	
Rainfall Intensity	108.9	mm/hr
Pre Development Peak Flow	0.07	m^3/s

Return Rate	10	year
Peaking Coefficient (Ci)	1.00	
Rainfall Intensity	126.5	mm/hr
Pre Development Peak Flow	0.08	m^3/s

Return Rate	25	year
Peaking Coefficient (Ci)	1.10	
Rainfall Intensity	148.2	mm/hr
Pre Development Peak Flow	0.10	m^3/s

Return Rate	50	year
Peaking Coefficient (Ci)	1.20	
Rainfall Intensity	164.2	mm/hr
Pre Development Peak Flow	0.13	m^3/s

Return Rate	100	year
Peaking Coefficient (Ci)	1.25	
Rainfall Intensity	180.2	mm/hr
Pre Development Peak Flow	0.14	m^3/s

Sean Homes - Veteran's Lane
Post-Development Peak Flows

City of Barrie

Storm (yrs)	Coeff A	Coeff B	Coeff C
2	**678.09**	**4.70**	**0.78**
5	**853.61**	**4.70**	**0.77**
10	**975.87**	**4.70**	**0.76**
25	**1146.28**	**4.92**	**0.76**
50	**1236.15**	**4.70**	**0.75**
100	**1426.41**	**5.27**	**0.76**

Modified Rational Method
Q = CiCIA / 360

Where:

Q -	Flow Rate (m^3/s)
C -	Runoff Coefficient
I -	Storm Intensity (mm/hr)
A -	Area (ha.)
Ci -	Peaking Coefficient

	Controlled		Uncontrolled	
Area Number	1		2	
Area	0.84	ha	0.08	ha
Runoff Coefficient	0.69		0.52	
Time of Concentration	10	min	10	min
Return Rate	2	year	2	year
Peaking Coefficient (Ci)	1.00		1.00	
Rainfall Intensity	83.1	mm/hr	83.1	mm/hr
Post Development Peak Flow	0.13	m^3/s	0.01	m^3/s
Return Rate	5	year	5	year
Peaking Coefficient (Ci)	1.00		1.00	
Rainfall Intensity	108.9	mm/hr	108.9	mm/hr
Post Development Peak Flow	0.17	m^3/s	0.01	m^3/s
Return Rate	10	year	10	year
Peaking Coefficient (Ci)	1.00		1.00	
Rainfall Intensity	126.5	mm/hr	126.5	mm/hr
Post Development Peak Flow	0.20	m^3/s	0.01	m^3/s
Return Rate	25	year	25	year
Peaking Coefficient (Ci)	1.10		1.10	
Rainfall Intensity	148.2	mm/hr	148.2	mm/hr
Post Development Peak Flow	0.26	m^3/s	0.02	m^3/s
Return Rate	50	year	50	year
Peaking Coefficient (Ci)	1.20		1.20	
Rainfall Intensity	164.2	mm/hr	164.2	mm/hr
Post Development Peak Flow	0.31	m^3/s	0.02	m^3/s
Return Rate	100	year	100	year
Peaking Coefficient (Ci)	1.25		1.25	
Rainfall Intensity	180.2	mm/hr	180.2	mm/hr
Post Development Peak Flow	0.36	m^3/s	0.03	m^3/s

PEARSON ENGINEERING LTD.

Sean Homes - Veteran's Lane
Quantity Control Volume Calculations

DATE: 7-Oct-19
FILE: 18079
CONTRACT/PROJECT: Sean Mason Homes - Veterans
COMPLETED BY: AMC

Modified Rational Method Parameters

Pre Development Area (ha)	Post Development Area (ha)	Time of Concentration (min)	Time Increments (min)	Pre Development Runoff Coefficient	Post Development Runoff Coefficient
0.915	0.837	10	1	0.25	0.69

Note: Refer to page Calculation of Runoff Coefficients for detailed calculations of Modified Rational Method parameters.

Pre-Development Runoff Rate

	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
C	0.25	0.25	0.25	0.28	0.30	0.31
I	83.11	108.92	126.55	148.15	164.22	180.15
A	0.91	0.91	0.91	0.91	0.91	0.91
Q	0.05	0.07	0.08	0.10	0.13	0.14

Note: Q= 0.00278CIA

Rainfall Station	Barrie

SWM Pond Design Input

Storm (yrs)	Chicago Storm Coefficient A	Chicago Storm Coefficient B	Chicago Storm Coefficient C	Allowable Outflow (m3/s)	Post Development Runoff Coefficient
2	678.085	4.699	0.781	0.04	0.69
5	853.608	4.699	0.766	0.06	0.69
10	975.865	4.699	0.760	0.07	0.69
25	1146.275	4.922	0.757	0.09	0.75
50	1236.150	4.699	0.751	0.10	0.82
100	1426.408	5.273	0.759	0.12	0.86

Results

Storm Event	Storage m^3	Time min
2	70	30
5	93	32
10	109	33
25	143	34
50	173	34
100	201	35

Note: Storage volume calculated as per Hydrology Handbook, Second Edition, American Society of Civil Engineers, 1996

Time (min)	2 Year Intensity mm/hr	2 Year Inflow m^3/s	2 Year Outflow m^3/s	2 Year Storage m^3	Difference	5 Year Intensity mm/hr	5 Year Inflow m^3/s	5 Year Outflow m^3/s	5 Year Storage m^3	Difference	10 Year Intensity mm/hr	10 Year Inflow m^3/s	10 Year Outflow m^3/s	10 Year Storage m^3	Difference	25 Year Intensity mm/hr	25 Year Inflow m^3/s	25 Year Outflow m^3/s	25 Year Storage m^3	Difference	50 Year Intensity mm/hr	50 Year Inflow m^3/s	50 Year Outflow m^3/s	50 Year Storage m^3	Difference	100 Year Intensity mm/hr	100 Year Inflow m^3/s	100 Year Outflow m^3/s	100 Year Storage m^3	Difference
1	174.18	0.278	0.044	2	11	225.07	0.358	0.057	3	15	260.01	0.414	0.066	3	17	298.22	0.522	0.086	3	22	334.55	0.639	0.104	4	26	353.96	0.705	0.118	3	30
2	153.52	0.245	0.044	14	9	198.85	0.317	0.057	17	12	229.94	0.366	0.066	20	13	264.99	0.464	0.086	25	17	296.30	0.566	0.104	31	21	316.38	0.630	0.118	33	24
3	137.71	0.220	0.044	22	7	178.75	0.285	0.057	29	9	206.87	0.330	0.066	33	11	239.26	0.419	0.086	42	14	266.91	0.510	0.104	51	17	286.90	0.571	0.118	57	19
4	125.19	0.200	0.044	30	6	162.79	0.259	0.057	38	8	188.54	0.300	0.066	44	9	218.67	0.383	0.086	56	12	243.52	0.465	0.104	68	14	263.10	0.524	0.118	76	16
5	114.99	0.183	0.044	35	5	149.77	0.239	0.057	46	6	173.57	0.276	0.066	53	7	201.77	0.354	0.086	68	10	224.41	0.429	0.104	82	12	243.43	0.485	0.118	92	14
6	106.50	0.170	0.044	40	4	138.93	0.221	0.057	52	5	161.10	0.257	0.066	60	6	187.63	0.329	0.086	77	8	208.47	0.398	0.104	94	10	226.85	0.452	0.118	106	12
7	99.33	0.158	0.044	44	3	129.73	0.207	0.057	58	5	150.52	0.240	0.066	67	5	175.59	0.308	0.086	86	7	194.94	0.373	0.104	104	9	212.68	0.423	0.118	117	10
8	93.16	0.149	0.044	48	3	121.83	0.194	0.057	62	4	141.42	0.225	0.066	72	5	165.20	0.289	0.086	93	6	183.29	0.350	0.104	112	7	200.41	0.399	0.118	128	9
9	87.81	0.140	0.044	51	3	114.96	0.183	0.057	66	3	133.51	0.213	0.066	77	4	156.14	0.274	0.086	99	5	173.15	0.331	0.104	120	7	189.66	0.378	0.118	136	8
10	83.11	0.132	0.044	53	2	108.92	0.173	0.057	70	3	126.55	0.202	0.066	81	4	148.15	0.260	0.086	104	5	164.22	0.314	0.104	126	6	180.15	0.359	0.118	144	7
11	78.94	0.126	0.044	56	2	103.57	0.165	0.057	73	3	120.37	0.192	0.066	85	3	141.05	0.247	0.086	109	4	156.30	0.299	0.104	132	5	171.69	0.342	0.118	151	6
12	75.23	0.120	0.044	58	2	98.78	0.157	0.057	76	2	114.85	0.183	0.066	88	3	134.69	0.236	0.086	113	4	149.22	0.285	0.104	137	4	164.09	0.327	0.118	157	5
13	71.88	0.115	0.044	59	2	94.48	0.150	0.057	78	2	109.89	0.175	0.066	91	2	128.97	0.226	0.086	117	3	142.84	0.273	0.104	142	4	157.23	0.313	0.118	163	5
14	68.86	0.110	0.044	61	1	90.58	0.144	0.057	80	2	105.39	0.168	0.066	93	2	123.77	0.217	0.086	121	3	137.07	0.262	0.104	146	4	151.00	0.301	0.118	167	4
15	66.12	0.105	0.044	62	1	87.04	0.139	0.057	82	2	101.30	0.161	0.066	95	2	119.04	0.209	0.086	123	3	131.81	0.252	0.104	149	3	145.31	0.289	0.118	172	4
16	63.61	0.101	0.044	63	1	83.80	0.133	0.057	83	1	97.56	0.155	0.066	97	2	114.71	0.201	0.086	126	2	127.00	0.243	0.104	152	3	140.09	0.279	0.118	175	3
17	61.31	0.098	0.044	64	1	80.82	0.129	0.057	85	1	94.12	0.150	0.066	99	2	110.72	0.194	0.086	129	2	122.58	0.234	0.104	155	3	135.29	0.269	0.118	179	3
18	59.19	0.094	0.044	65	1	78.08	0.124	0.057	86	1	90.95	0.145	0.066	101	1	107.05	0.188	0.086	131	2	118.50	0.226	0.104	158	2	130.86	0.261	0.118	182	3
19	57.23	0.091	0.044	66	1	75.55	0.120	0.057	87	1	88.02	0.140	0.066	102	1	103.64	0.182	0.086	133	2	114.72	0.219	0.104	160	2	126.75	0.252	0.118	185	2
20	55.41	0.088	0.044	67	1	73.19	0.117	0.057	88	1	85.30	0.136	0.066	103	1	100.48	0.176	0.086	134	1	111.22	0.213	0.104	162	2	122.92	0.245	0.118	187	2
21	53.72	0.086	0.044	67	1	71.00	0.113	0.057	89	1	82.77	0.132	0.066	104	1	97.53	0.171	0.086	136	1	107.95	0.206	0.104	164	2	119.35	0.238	0.118	189	2
22	52.14	0.083	0.044	68	0	68.95	0.110	0.057	90	1	80.40	0.128	0.066	105	1	94.78	0.166	0.086	137	1	104.90	0.201	0.104	165	1	116.02	0.231	0.118	191	2
23	50.67	0.081	0.044	68	0	67.04	0.107	0.057	91	1	78.18	0.125	0.066	106	1	92.19	0.162	0.086	138	1	102.04	0.195	0.104	167	1	112.89	0.225	0.118	193	2
24	49.28	0.079	0.044	69	0	65.24	0.104	0.057	91	0	76.10	0.121	0.066	107	1	89.77	0.157	0.086	139	1	99.36	0.190	0.104	168	1	109.95	0.219	0.118	195	1
25	47.98	0.076	0.044	69	0	63.55	0.101	0.057	92	0	74.15	0.118	0.066	107	1	87.49	0.153	0.086	140	1	96.84	0.185	0.104	169	1	107.18	0.213	0.118	196	1
26	46.76	0.075	0.044	69	0	61.96	0.099	0.057	92	0	72.31	0.115	0.066	108	0	85.34	0.150	0.086	141	1	94.46	0.181	0.104	170	1	104.57	0.208	0.118	197	1
27	45.60	0.073	0.044	69	0	60.46	0.096	0.057	92	0	70.57	0.112	0.066	108	0	83.31	0.146	0.086	141	1	92.21	0.176	0.104	171	1	102.10	0.203	0.118	198	1
28	44.51	0.071	0.044	69	0	59.04	0.094	0.057	93	0	68.92	0.110	0.066	109	0	81.39	0.143	0.086	142	0	90.09	0.172	0.104	171	1	99.76	0.199	0.118	199	1
29	43.47	0.069	0.044	69	0	57.69	0.092	0.057	93	0	67.36	0.107	0.066	109	0	79.56	0.139	0.086	142	0	88.07	0.168	0.104	172	0	97.55	0.194	0.118	199	1
30	42.49	0.068	0.044	70	0	56.41	0.090	0.057	93	0	65.88	0.105	0.066	109	0	77.83	0.136	0.086	143	0	86.16	0.165	0.104	172	0	95.44	0.190	0.118	200	0
31	41.56	0.066	0.044	70	0	55.20	0.088	0.057	93	0	64.47	0.103	0.066	109	0	76.19	0.133	0.086	143	0	84.34	0.161	0.104	172	0	93.44	0.186	0.118	200	0
32	40.67	0.065	0.044	69	0	54.04	0.086	0.057	93	0	63.13	0.101	0.066	109	0	74.62	0.131	0.086	143	0	82.61	0.158	0.104	173	0	91.53	0.182	0.118	201	0
33	39.83	0.063	0.044	69	0	52.94	0.084	0.057	93	0	61.86	0.099	0.066	109	0	73.13	0.128	0.086	143	0	80.96	0.155	0.104	173	0	89.71	0.179	0.118	201	0
34	39.02	0.062	0.044	69	0	51.89	0.083	0.057	93	0	60.64	0.097	0.066	109	0	71.70	0.126	0.0856	143	0	79.38	0.152	0.104	173	0	87.97	0.175	0.118	201	0
35	38.25	0.061	0.044	69	0	50.89	0.081	0.057	93	0	59.47	0.095	0.066	109	0	70.33	0.123	0.0856	143	0	77.87	0.149	0.104	173	0	86.31	0.172	0.118	201	0
36	37.51	0.060	0.044	69	0	49.92	0.080	0.057	93	0	58.36	0.093	0.066	109	0	69.03	0.121	0.0856	143	0	76.43	0.146	0.104	173	0	84.71	0.169	0.118	201	0
37	36.81	0.059	0.044	69	0	49.01	0.078	0.057	93	0	57.29	0.091	0.066	109	0	67.78	0.119	0.0856	143	0	75.05	0.143	0.104	172	0	83.19	0.166	0.118	201	0
38	36.13	0.058	0.044	68	0	48.12	0.077	0.057	92	0	56.27	0.090	0.066	109	0	66.58	0.117	0.0856	143	0	73.73	0.141	0.104	172	0	81.73	0.163	0.118	201	0
39	35.49	0.057	0.044	68	0	47.28	0.075	0.057	92	0	55.29	0.088	0.066	108	0	65.43	0.115	0.0856	142	0	72.46	0.138	0.104	172	0	80.32	0.160	0.118	200	0
40	34.87	0.056	0.044	68	0	46.47	0.074	0.057	92	0	54.35	0.087	0.066	108	0	64.32	0.113	0.0856	142	0	71.24	0.136	0.104	171	0	78.97	0.157	0.118	200	0
41	34.27	0.055	0.044	68	0	45.68	0.073	0.057	91	0	53.44	0.085	0.066	108	0	63.26	0.111	0.0856	142	0	70.06	0.134	0.104	171	-1	77.67	0.155	0.118	199	-1
42	33.69	0.054	0.044	67	0	44.93	0.072	0.057	91	0	52.57	0.084	0.066	107	0	62.24	0.109	0.0856	141	0	68.93	0.132	0.104	170	-1	76.42	0.152	0.118	199	-1
43	33.14	0.053	0.044	67	0	44.21	0.070	0.057	91	0	51.73	0.082	0.066	107	0	61.25	0.107	0.0856	141	-1	67.84	0.130	0.104	170	-1	75.22	0.150	0.118	198	-1
44	32.61	0.052	0.044	66	0	43.51	0.069	0.057	90	0	50.92	0.081	0.066	106	0	60.30	0.106	0.0856	140	-1	66.79	0.128	0.104	169	-1	74.05	0.147	0.118	198	-1
45	32.09	0.051	0.044	66	0	42.84	0.068	0.057	90	0	50.14	0.080	0.066	106	-1	59.39	0.104	0.0856	140	-1	65.78	0.126	0.104	169	-1	72.93	0.145	0.118	197	-1
46	31.60	0.050	0.044	66	0	42.19	0.067	0.057	89	0	49.38	0.079	0.066	105	-1	58.50	0.102	0.0856	139	-1	64.81	0.124	0.104	168	-1	71.85	0.143	0.118	196	-1
47	31.12	0.050	0.044	65	0	41.57	0.066	0.057	89	-1	48.66	0.078	0.066	105	-1	57.65	0.101	0.0856	138	-1	63.86	0.122	0.104	167	-1	70.81	0.141	0.118	195	-1
48	30.66	0.049	0.044	65	0	40.96	0.065	0.057	88	-1	47.95	0.076	0.066	104	-1	56.82	0.100	0.0856	138	-1	62.95	0.120	0.104	166	-1	69.80	0.139	0.118	194	-1
49	30.21	0.048	0.044	64	0	40.37	0.064	0.057	88	-1	47.27	0.075	0.066	104	-1	56.02	0.098	0.0856	137	-1	62.07	0.119	0.104	165	-1	68.82	0.137	0.118	193	-1
50	29.78	0.047	0.044	64	-1	39.81	0.063	0.057	87	-1	46.61	0.074	0.066	103	-1	55.25	0.097	0.0856	136	-1	61.21	0.117	0.104	165	-1	67.87	0.135	0.118	192	-1
51	29.36	0.047	0.044	63	-1	39.26	0.063	0.057	87	-1	45.98	0.073	0.066	102	-1	54.50	0.095	0.0856	135	-1	60.39	0.115	0.104	164	-1	66.95	0.133	0.118	191	-1
52	28.96	0.046	0.044	63	-1	38.73	0.062	0.057	86	-1	45.36	0.072	0.066	102	-1	53.77	0.094	0.0856	135	-1	59.58	0.114	0.104	163	-1	66.06	0.132	0.118	190	-1
53	28.56	0.046	0.044	62	-1	38.21	0.061	0.057	85	-1	44.76	0.071	0.066	101	-1	53.07	0.093	0.0856	134	-1	58.81	0.112	0.104	162	-1	65.20	0.130	0.118	189	-1
54	28.18	0.045	0.044	62	-1	37.71	0.060	0.057	85	-1	44.18	0.070	0.066	100	-1	52.38	0.092	0.0856	133	-1	58.05	0.111	0.104	161	-1	64.36	0.128	0.118	188	-1
55	27.81	0.044	0.044	61	-1	37.23	0.059	0.057	84	-1	43.62	0.069	0.066	100	-1	51.72	0.091	0.0856	132	-1	57.32	0.110	0.104	160	-1	63.55	0.127	0.118	187	-1
56	27.45	0.044	0.044	61	-61	36.76	0.059	0.057	83	-1	43.07	0.069	0.066	99	-1	51.08	0.089	0.0856	131	-1	56.61	0.108	0.104	159	-1	62.76	0.125	0.118	186	-1
57	27.11	0.043	0.000	0	0	36.30	0.058	0.057	83	-83	42.54	0.068	0.066	98	-1	50.45	0.088	0.0856	130	-1	55.92	0.107	0.104	157	-1	62.00	0.123	0.118	184	-1
58	26.77	0.043	0.000	0	0	35.86	0.057	0.000	0	0	42.02	0.067	0.066	97	-97	49.84	0.087	0.0856	129	-1	55.25	0.106	0.104	156	-1	61.25	0.122	0.118	183	-1
59	26.44	0.042	0.000	0	0	35.42	0.056	0.000	0	0	41.52	0.066	0.000	0	0	49.25	0.086	0.0856	128	-128	54.60	0.104	0.104	155	-155	60.53	0.121	0.118	182	-1
60	26.12	0.042	0.000	0	0	35.00	0.056	0.000	0	0	41.03	0.065	0.000	0	0	48.68	0.085	0.0000	0	0	53.96	0.103	0.000	0	0	59.82	0.119	0.118	180	-180
61	25.81	0.041	0.000	0	0	34.59	0.055	0.000	0	0	40.56	0.065	0.000	0	0	48.12	0.084	0.0000	0	0	53.34	0.102	0.000	0	0	59.14	0.118	0.000	0	0

: Maximum Storage Volume

PEARSON ENGINEERING LTD.

Infiltration Volume Calculations
Sean Homes - Veteran's Lane

Infiltration volumes from MOE Stormwater Management Planning and Design Manual
Table 3.2 Water Quality Storage Requirements are as follows:

Design Area Total	=	0.91	ha		
Total Imperviousness	=	65%			
Storage Volume	=	33.7	m^3/ha		(Enhanced 80% long-term S.S. removal
Storage Volume Required	=	0.91		x	33.7
	=	30.8	m^3		

Using 25 mm over impervious areas, infiltration storage volumes are as follows:

Storage Volume (V)	=	0.025	x	Impervious Area
	=	0.025	x	5962
	=	149.1	m^3	

Therefore, the site will have a combined storage volume of a minimum of 150 m^3 for infiltration/filtration to satisfy LSRCA Volume Control Criteria.

PEARSON ENGINEERING LTD.

Q= 0.0028*C*I*A (cms)
C=RUNOFF COEFFICIENT
I-RAINFALL INTENSITY= A/(Time+B)^C
A=AREA (ha)

Veteran's Lane
Storm Sewer Design
Pre Development

DATE: 7-Oct-19
FILE: 18079
CONTRACT/PROJECT VETERAN'S LANE

Areas	MANHOLE		LENGTH	INCREMENT			TOTAL	FLOW TIME (min)		I	TOTAL Q	S	D	Q FULL	V FULL	% FULL
	FROM	TO	(m)	C	A	CA	CA	TO	IN	(mm/h)	(cms)	(%)	(mm)	(cms)	(m/s)	(%)
2	DICB1	MH1	40.0	0.90	1.40	1.26	1.26	10.00	0.37	101.72	0.36	1.00	450	0.29	1.79	125%
4	DICB2	MH1	40.0	0.90	0.37	0.33	0.33	10.00	0.69	101.72	0.09	0.50	300	0.07	0.97	138%
3	MH1	MH1	15.4	0.90	0.17	0.15	1.75	10.69	0.10	101.72	0.49	2.20	450	0.42	2.66	117%
1	CBMH1	MH1	29.0	0.90	0.97	0.87	0.87	10.00	0.21	101.72	0.25	1.10	600	0.64	2.28	38%
	FUTURE CBMH	MH1										0.50	450	0.20	1.27	
5, 6	MH1	MH2	85.5	0.88	0.94	0.83	3.45	10.79	0.59	101.72	0.97	1.06	675	0.87	2.42	113%
7, 11	MH5	MH2	17.8	0.85	1.45	1.23	1.23	10.00	0.21	101.72	0.35	0.51	525	0.31	1.42	113%
8	MH2	MH3	61.0	0.65	0.22	0.14	4.82	11.37	0.35	103.42	1.39	1.30	750	1.27	2.87	109%
9	MH3	MH4	33.6	0.90	1.12	1.01	5.83	11.73	0.19	101.72	1.65	1.37	750	1.30	2.95	126%
10	DICB6	MH4/MH1	15.0	0.60	0.58	0.35	0.35	10.00	0.07	110.69	0.11	8.00	250	0.17	3.43	64%
	MH1	MH2	49.8	0.0	0.0	0.00	6.18	11.92	0.25	100.84	1.73	1.70	750	1.45	3.29	119%
	MH7	MH2	55.0	0.45	0.76	0.34	0.34	10.00	0.53	110.69	0.11	1.60	300	0.12	1.73	86%
	MH2	MH3	86.5	0.45	0.62	0.28	6.80	12.17	0.50	99.69	1.88	1.15	825	1.54	2.88	122%

PEARSON ENGINEERING LTD.

Q= 0.0028*C*I*A (cms)
C=RUNOFF COEFFICIENT
I-RAINFALL INTENSITY= A/(Time+B)^C
A=AREA (ha)

Veteran's Lane
Storm Sewer Design
Pre Development

DATE: 7-Oct-19
FILE: 18079
CONTRACT/PROJECT VETERAN'S LANE

Areas	MANHOLE		LENGTH	INCREMENT			TOTAL	FLOW TIME (min)		I	TOTAL Q	S	D	Q FULL	V FULL	% FULL
	FROM	TO	(m)	C	A	CA	CA	TO	IN	(mm/h)	(cms)	(%)	(mm)	(cms)	(m/s)	(%)
	MH11	MH8	19.5	0.54	0.81	0.44	0.44	10.00	0.20	110.69	0.13	1.08	375	0.18	1.65	74%
	MH8	MH3	66.7	0.54	0.44	0.24	0.68	10.20	0.51	109.58	0.21	1.50	450	0.35	2.20	59%
	CBMH10	MH3	43.5	0.54	0.20	0.11	0.11	10.00	0.75	110.69	0.03	0.50	300	0.07	0.97	49%
	MH3	MH4	88.8	0.54	0.46	0.25	7.83	12.67	0.52	97.50	2.12	1.00	900	1.81	2.85	117%
	MH4	MH5	82.0	0.57	1.15	0.66	8.49	13.19	0.45	95.34	2.25	1.15	900	1.94	3.05	116%
	CBMH9	MH5	45.0	0.50	0.67	0.34	0.34	10.00	0.22	110.69	0.10	6.00	300	0.24	3.35	43%
	MH5	MH6	125.5	0.50	0.16	0.08	8.90	13.19	0.89	95.34	2.36	0.56	1050	2.04	2.36	115%
	MH6	OUTFALL	140.0	0.00	0.00	0.00	8.90	13.64	0.84	93.56	2.31	0.78	1050	2.41	2.79	96%

Notes:
1. Storm sewer design sheet created by using the Storm Drainage Area Plan for the Beacon Road Subdivion, completed by R.G. Robinson and Associates, as well as the Storm Drainage Area Plan for the Essa/Ferndale Development by R.G. Robinson and Associates.
2. The recreated storm sewer design sheet was completed to show the current capacity of the existing storm sewer.

PEARSON ENGINEERING LTD.

Q= 0.0028*C*I*A (cms)
C=RUNOFF COEFFICIENT
I-RAINFALL INTENSITY= A/(Time+B)^C
A=AREA (ha)

Veteran's Lane
Storm Sewer Design
Post Development

DATE: 7-Oct-19
FILE: 18079
CONTRACT/PROJECT VETERAN'S LANE

Areas	MANHOLE		LENGTH	INCREMENT			TOTAL	FLOW TIME (min)		I	TOTAL Q	S	D	Q FULL	V FULL	% FULL
	FROM	TO	(m)	C	A	CA	CA	TO	IN	(mm/h)	(cms)	(%)	(mm)	(cms)	(m/s)	(%)
2	DICB1	MH1	40.0	0.90	1.40	1.26	1.26	10.00	0.37	101.72	0.36	1.00	450	0.29	1.79	125%
4	DICB2	MH1	40.0	0.90	0.37	0.33	0.33	10.00	0.69	101.72	0.09	0.50	300	0.07	0.97	138%
3	MH1	MH1	15.4	0.90	0.17	0.15	1.75	10.69	0.10	101.72	0.49	2.20	450	0.42	2.66	117%
1	CBMH1	MH1	29.0	0.90	0.97	0.87	0.87	10.00	0.21	101.72	0.25	1.10	600	0.64	2.28	38%
	FUTURE CBMH	MH1										0.50	450	0.20	1.27	
5, 6	MH1	MH2	85.5	0.88	0.94	0.83	3.45	10.79	0.59	101.72	0.97	1.06	675	0.87	2.42	113%
7, 11	MH5	MH2	17.8	0.85	1.40	1.19	1.19	10.00	0.21	101.72	0.34	0.51	525	0.31	1.42	110%
8	MH2	MH3	61.0	0.65	0.13	0.08	4.72	11.37	0.35	103.42	1.36	1.30	750	1.27	2.87	107%
9	MH3	MH4	33.6	0.90	1.12	1.01	5.73	11.73	0.19	101.72	1.62	1.37	750	1.30	2.95	124%
PROJECT SITE	MH1	DICB6	11.7								0.07	1.00	300	0.10	1.37	72%
10	DICB6	MH4/MH1	15.0	0.60	0.58	0.35	0.35	10.00	0.07	110.69	0.18	8.00	250	0.17	3.43	105%
	MH1	MH2	49.8	0.0	0.0	0.00	6.08	11.92	0.25	100.84	1.77	1.70	750	1.45	3.29	122%
	MH7	MH2	55.0	0.45	0.76	0.34	0.34	10.00	0.53	110.69	0.11	1.60	300	0.12	1.73	86%
	MH2	MH3	86.5	0.45	0.62	0.28	6.70	12.17	0.50	99.69	1.92	1.15	825	1.54	2.88	125%

PEARSON ENGINEERING LTD.

Q= 0.0028*C*I*A (cms)
C=RUNOFF COEFFICIENT
I-RAINFALL INTENSITY= A/(Time+B)^C
A=AREA (ha)

Veteran's Lane
Storm Sewer Design
Post Development

DATE: 7-Oct-19
FILE: 18079
CONTRACT/PROJECT VETERAN'S LANE

Areas	MANHOLE		LENGTH	INCREMENT			TOTAL	FLOW TIME (min)		I	TOTAL Q	S	D	Q FULL	V FULL	% FULL
	FROM	TO	(m)	C	A	CA	CA	TO	IN	(mm/h)	(cms)	(%)	(mm)	(cms)	(m/s)	(%)
	MH11	MH8	19.5	0.54	0.81	0.44	0.44	10.00	0.20	110.69	0.13	1.08	375	0.18	1.65	74%
	MH8	MH3	66.7	0.54	0.44	0.24	0.68	10.20	0.51	109.58	0.21	1.50	450	0.35	2.20	59%
	CBMH10	MH3	43.5	0.54	0.20	0.11	0.11	10.00	0.75	110.69	0.03	0.50	300	0.07	0.97	49%
	MH3	MH4	88.8	0.54	0.46	0.25	7.73	12.67	0.52	97.50	2.16	1.00	900	1.81	2.85	119%
	MH4	MH5	82.0	0.57	1.15	0.66	8.38	13.19	0.45	95.34	2.29	1.15	900	1.94	3.05	118%
	CBMH9	MH5	45.0	0.50	0.67	0.34	0.34	10.00	0.22	110.69	0.10	6.00	300	0.24	3.35	43%
	MH5	MH6	125.5	0.50	0.16	0.08	8.80	13.19	0.89	95.34	2.40	0.56	1050	2.04	2.36	117%
	MH6	OUTFALL	140.0	0.00	0.00	0.00	8.80	13.64	0.84	93.56	2.36	0.78	1050	2.41	2.79	98%

Notes:
1. Storm sewer design sheet created by using the Storm Drainage Area Plan for the Beacon Road Subdivion, completed by R.G. Robinson and Associates, as well as the Storm Drainage Area Plan for the Essa/Ferndale Development by R.G. Robinson and Associates.
2. The recreated storm sewer design sheet was modified to add the peak flow from the proposed development upstream of DICB6.

Appendix D
Water Balance Calculations

PEARSON ENGINEERING LTD.

Sean Homes - Veteran's Lane
Water Balance Calculations

Pre Development Recharge

Precipitation data taken from Environment Canada information for the City of Barrie.

Yearly Precipitation = 932.9 mm

Using Table 3.1 of the MOE's SWM Planning & Design Manual, the infiltration amount is approximately 28.0% of the precipitation value for Pasture and Shrubs for Fine Sandy Loam. Using site specific rainfall data, the infiltration can be calculated.

Pasture and Shrubs = 0.80 ha

Annual Site Area Recharge Volume = 0.80 x 0.28 x 932.9
= 2087 m^3

Therefore, 2087 m^3 per year of recharge volume is required for the proposed project

Post Development Recharge

Using Table 3.1 of the MOE's SWM Planning & Design Manual, the infiltration amount for Urban Lawns is approximately 24%

Grassed Area = 0.32 ha

Annual Site Area Recharge Volume = 0.32 x 0.24 x 932.9
= 713 m^3

Therefore, post development infiltration deficit is as follows

Deficit Volume = Pre Development - Post Development
= 2087 - 713
= 1373 m^3

Recharge Basin

Find the depth of annual rainfall required to infiltrate 1180 m^3 from the area into the ground.

Drainage Area Contributing to Infiltration Locations = 8366 m^2
Infiltration Deficit = 1373 m^3

Annual Precipitation Depth Required

Req'd Precipitation Depth = $\frac{1373\ m^3}{8366\ m^2}$
= 164.2 mm

The runoff coefficient for the contributing area is 0.69, therefore the following yearly precipitation depth is required:

Precipitation Depth = $\frac{164.2\ mm}{0.69}$
= 237.9 mm

Find Percent of Annual Precipitation that Req'd Precipitation Depth represents

Annual Precipitation for Study Area	=	932.9	mm
% Annual Rainfall	=	237.9	mm
		932.9	mm
	=	26%	

From MOE Figure C-2, 26% of annual rainfall occurs for storm events of 2 mm or less.

Contributing Area	=	8366	m^2		
Precipitation Depth	=	2	mm		
Storage Volume Req'd	=	A		x	D
	=	8366		x	2
	=	16.7	m^3		

Minimum Infiltration Volume as per City of Barrie Storm Drainage and Stormwater Management Policies and Design Guidelines Section 4.1.3 is as follows:

Storage Volume Req'd	=	Site Area	x	5 mm
	=	9148	x	0.005
	=	46	m^3	

Therefore, City of Barrie guidelines governs over water balance/infiltration requirements. An infiltration gallery will be sized to provide a minimum of 46 m^3 of storage at detailed design to satisfy water balance criteria.

Appendix E
Phosphorus Calculations

PEARSON ENGINEERING LTD.

Sean Homes - Veteran's Lane
Phosphorus Budget

Barrie Creeks	Low Intensity Development	Hay Pasture	High Intensity - Residential	Forest
Phosphorus Export (kg/ha/year)	0.13	0.08	1.32	0.05

Pre-Development Condition

	Low Intensity Development	Hay Pasture	High Intensity - Residential	Forest
Area (ha)	0.52	0.30	0.09	0.00
Total P (kg)	0.07	0.02	0.12	0.00
Total Pre-Development P (kg)		**0.21**		

Post Development Condition (Without Treatment)

	Low Intensity Development	Hay Pasture	High Intensity - Residential	Forest
Area (ha):	0.00	0.00	0.91	0.00
Total P (kg) :	0.00	0.00	1.21	0.00
Total Post Development (kg):		**1.21**		

Post Development Condition (With Treatment)

Uncontrolled Area	Low Intensity Development	Hay Pasture	High Intensity - Residential	Forest
Area (ha):	0.00	0.00	0.08	0.00
Total P (kg) :	0.00	0.00	0.10	0.00

Area Draining to Rain Gardens	Low Intensity Development	Hay Pasture	High Intensity - Residential	Forest
Area (ha):	0.00	0.00	0.50	0.00
Total P (kg):	0.00	0.00	0.66	0.00

Rain Garden Treatment	
Removal Efficiency (%):	60
P Removed (kg):	0.40
P Remaining (kg):	0.27

Area Draining to Surface Infiltration	Low Intensity Development	Hay Pasture	High Intensity - Residential	Forest
Area (ha):	0.00	0.00	0.06	0.00
Total P (kg):	0.00	0.00	0.08	0.00

Surface Infiltration Treatment

Removal Efficiency (%):	60
P Removed (kg):	0.05
P Remaining (kg):	0.03

Area Draining to Permeable Pavers	Low Intensity Development	Hay Pasture	High Intensity - Residential	Forest
Area (ha):	0.00	0.00	0.27	0.00
Total P (kg):	0.00	0.00	0.36	0.00

Permeable Pavers Treatment

Removal Efficiency (%):	45
P Removed (kg):	0.16
P Remaining (kg):	0.20

Underground Storage Treatment

P remaining (kg):	0.50
Removal Efficiency (%):	25
P Removed (kg):	0.12
P Remaining (kg):	0.37

Total Site P (kg) : 0.48

Appendix F
Letters to Utilities

PEARSON
ENGINEERING LTD.

October 7, 2019 File:18079

Attention: Stephen Cranley

55 Patterson Road,
Barrie, ON
L4N 3V9

Dear Stephen,

Re: Proposed Residential Townhouse Development
341 Veteran's Lane & 339 Veteran's Drive, Barrie
Request for Confirmation – Enbridge Servicing

We are currently preparing a Functional Servicing Report to examine the infrastructure requirements for a proposed residential development located at 341 Veteran's Lane and 339 Veteran's Drive in Barrie. The development consists of 6 townhouse blocks and a 4 storey complex with a total of 57 units. It will be serviced by a private condo road off of the existing Veteran's Lane. The subject property currently has one residential house.

We request that, if available, you provide us your existing servicing and plan in this area and we would appreciate any comments you could provide on the serviceability of the proposed development.

We thank you in advance for your assistance and co-operation in providing the background data. If you have any questions regarding the enclosed or require any additional information, please feel free to give me a call at (705) 719-4785.

Regards,
PEARSON ENGINEERING LTD.

April M Cleaves.

April Cleaves, B.A. Tech., C.E.T.
Project Manager

PEARSON
ENGINEERING LTD.

October 7, 2019 File:18079

Attention: Lorraine Cibirka

Ms. Lorraine Cibirka
Access Network Design
2nd Floor, 136 Bayfield Street
Barrie, Ontario
L4M 3B1

Dear Lorraine,

Re: Proposed Residential Townhouse Development
341 Veteran's Lane & 339 Veteran's Drive, Barrie
Request for Confirmation – Bell Servicing

We are currently preparing a Functional Servicing Report to examine the infrastructure requirements for a proposed residential development located at 341 Veteran's Lane and 339 Veteran's Drive in Barrie. The development consists of 6 townhouse blocks and a 4 storey complex with a total of 57 units. It will be serviced by a private condo road off of the existing Veteran's Lane. The subject property currently has one residential house.

We request that, if available, you provide us your existing servicing and plan in this area and we would appreciate any comments you could provide on the serviceability of the proposed development.

We thank you in advance for your assistance and co-operation in providing the background data. If you have any questions regarding the enclosed or require any additional information, please feel free to give me a call at (705) 719-4785.

Regards,
PEARSON ENGINEERING LTD.

April M Cleaves.

April Cleaves, B.A. Tech., C.E.T.
Project Manager

PEARSON
ENGINEERING LTD.

October 7, 2019 File:18079

Attention: David Smith, Enbridge Gas

David Smith
Enbridge Gas
10 Churchhill Drive
Barrie, Ontario
L4N 8Z5

Dear David,

Re: Proposed Residential Townhouse Development
341 Veteran's Lane & 339 Veteran's Drive, Barrie
Request for Confirmation – Enbridge Servicing

We are currently preparing a Functional Servicing Report to examine the infrastructure requirements for a proposed residential development located at 341 Veteran's Lane and 339 Veteran's Drive in Barrie. The development consists of 6 townhouse blocks and a 4 storey complex with a total of 57 units. It will be serviced by a private condo road off of the existing Veteran's Lane. The subject property currently has one residential house.

We request that, if available, you provide us your existing servicing and plan in this area and we would appreciate any comments you could provide on the serviceability of the proposed development.

We thank you in advance for your assistance and co-operation in providing the background data. If you have any questions regarding the enclosed or require any additional information, please feel free to give me a call at (705) 719-4785.

Regards,
PEARSON ENGINEERING LTD.

April M Cleaves.

April Cleaves, B.A. Tech., C.E.T.
Project Manager

PEARSON
ENGINEERING LTD.

October 7, 2019 File:18079

Attention: Xinyi Wang

Xinyi Wang
Rogers Cable
1 Sperling Drive
Barrie, Ontario
L4M 6B8

Dear Xinyi,

Re: Proposed Residential Townhouse Development
341 Veteran's Lane & 339 Veteran's Drive, Barrie
Request for Confirmation – Enbridge Servicing

We are currently preparing a Functional Servicing Report to examine the infrastructure requirements for a proposed residential development located at 341 Veteran's Lane and 339 Veteran's Drive in Barrie. The development consists of 6 townhouse blocks and a 4 storey complex with a total of 57 units. It will be serviced by a private condo road off of the existing Veteran's Lane. The subject property currently has one residential house.

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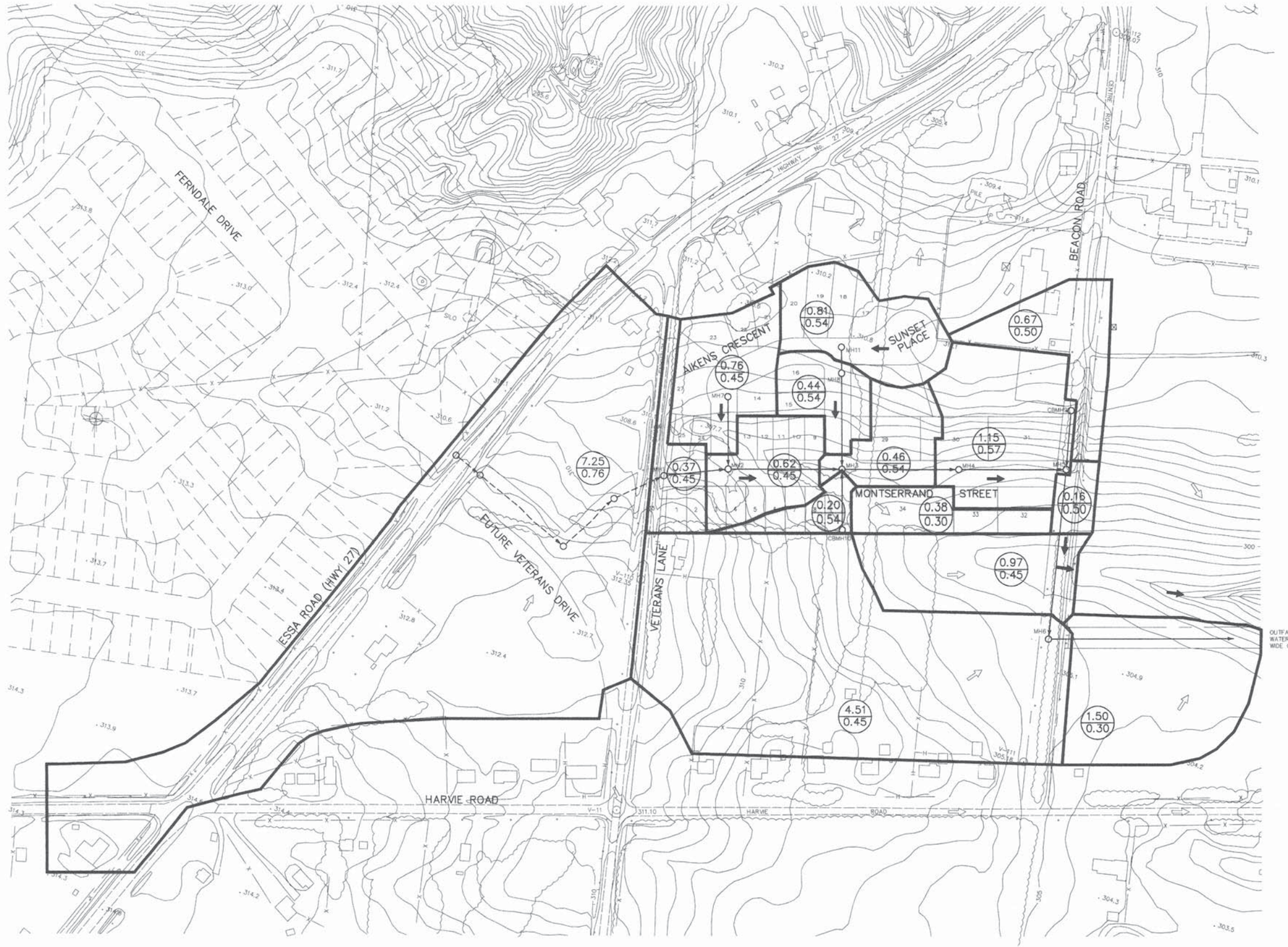
PEARSON ENGINEERING LTD.

April M Cleaves.

April Cleaves, B.A. Tech., C.E.T.
Project Manager

Appendix G
Engineering Drawings



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LEGEND

- 0.88 / 0.30 — AREA / RUNOFF VALUE
- DIRECTION OF EXISTING SHEET FLOW
- DIRECTION OF MAJOR STORM FLOW
- DRAINAGE AREA BOUNDARY
- PROPOSED STORM SEWER
- FUTURE STORM SEWER

Notes

BENCHMARK:

H.C.D. GLAVIC — LICENCED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO

NO.	REVISIONS	DATE	INITIAL
4	AS CONSTRUCTED	FEB 06	R.P.
3	ADD MEDIUM DENSITY BLOCK SERVICING	MAY 97	S.N.
2	THIRD SUBMISSION	MAR. 96	H.G.
1	FIRST SUBMISSION COMMENTS	FEB. 96	H.G.

Approved

CITY OF BARRIE
APPROVED
DATE. . . . . .
DIRECTOR OF MUNICIPAL WORKS

Approved

BEACON ROAD SUBDIVISION

STORM DRAINAGE AREA PLAN

RG ROBINSON AND ASSOCIATES (BARRIE) LTD — CONSULTING ENGINEERS
10 High Street, Suite 200, Barrie, Ontario (705) 721-9222

SCALE: 1:1500 | 322-91014-21/26

DESIGN HG | CHECKED HG | DWG. Nº G-4

DRAWN MR | DATE DEC. 95

Sub 202 1995-081-007

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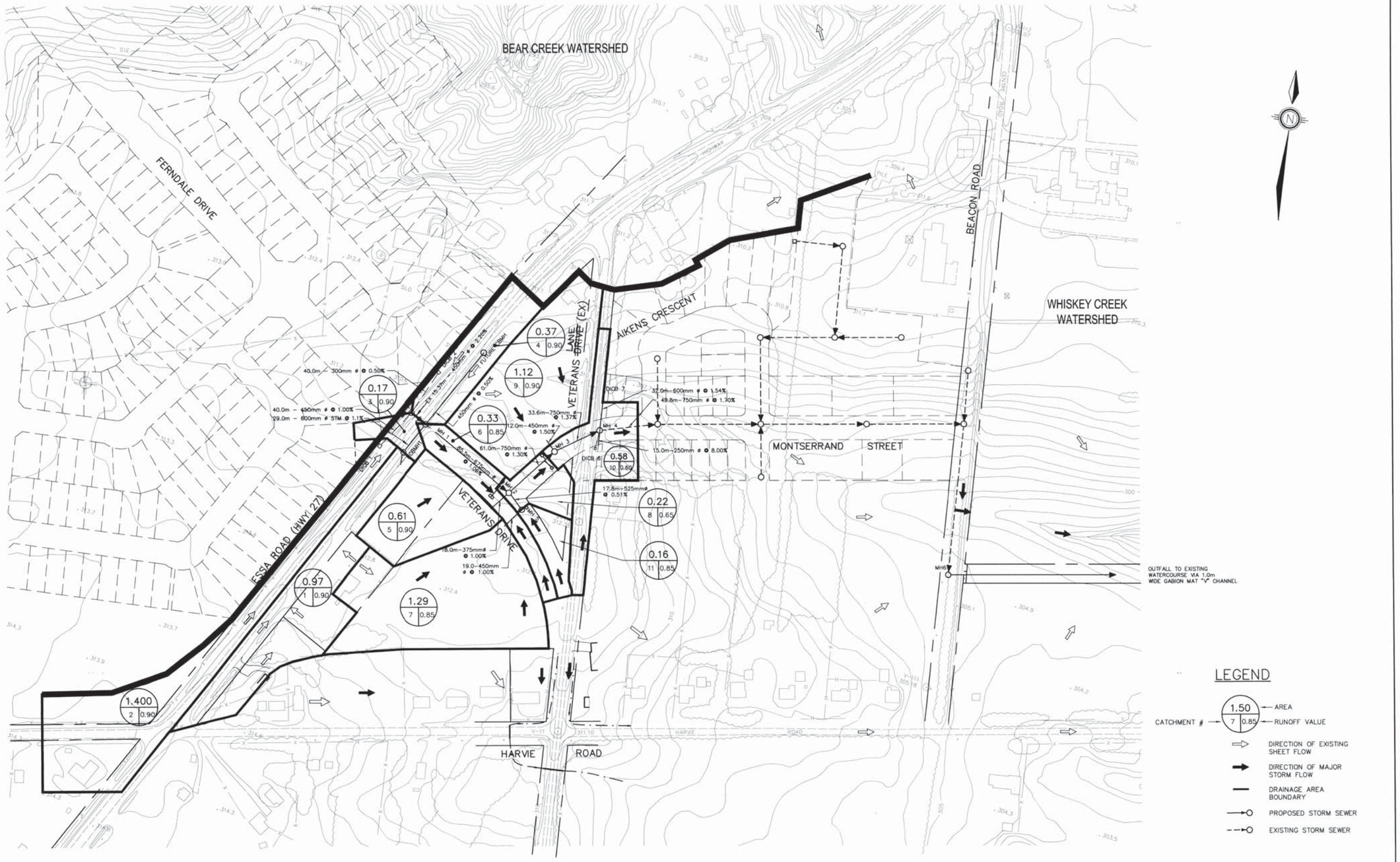

Notes

BENCHMARK:

NO.	REVISIONS	DATE	INITIAL
3.	AS CONSTRUCTED	02/10/03	MAT
2.	REVISIONS	MAR/02	GR
1.	2ND SUBMISSION: CATCHMENTS 3,5,7,8 MOD. – FUTURE ESSA ROAD SEWERS ADDED	APR 16/01	GR

Approved

Approved

ESSA /FERNDALE DEVELOPMENT

STORM DRAINAGE AREA PLAN

RG ROBINSON AND ASSOCIATES (BARRIE) LTD
CONSULTING ENGINEERS AND PLANNERS
10 High Street, Suite 200, Barrie, Ontario (705) 721-9222

SCALE: 1:1500

874-02016-20

DESIGN	DSM/GR	CHECKED	GR
DRAWN	LK/BJC	DATE	04/24/96

DWG. Nº G-2

2003-068-003

2003-68

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