Prepared By:

Servicing Feasibility Study

Sydenham Square Development - 2275 16th Street East Owen Sound, ON

GMBP File: 219112

November 2022

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SYDENHAM SQUARE DEVELOPMENT - 2275 16TH STREET EAST

SERVICING FEASIBILITY STUDY

NOVEMBER 2022

GMBP FILE: 219112

1. INTRODUCTION

Exquisite Developers Inc. proposes to develop the property located at 2275 16th Street East, Owen Sound as Sydenham Square. Development is planned to include residential and commercial spaces in several buildings.

Exquisite Real Estate Holdings Inc. has requested that GM BluePlan Engineering Ltd. (GMBP) provide engineering services to support the proposed development.

The City of Owen Sound has requested a Servicing Feasibility Study to confirm whether the proposed sanitary and water service connections are adequate.

2. SITE DESCRIPTION

2.1 Location And Topography

The 7.06 ha site is located at 2275 16th Street East within the eastern limits of the City of Owen Sound, on the south side of 16th Street (Hwy 26). The legal description of the site is Range 5, EGR Pt Park Lots 9 and 10 as per 16R-10096. The site is bound by 16th Street East to the North, Commercial property to the West, Former Canadian Pacific Railway (now Grey County trail system) to the East and undeveloped rural residential land and agricultural land to the South.

The Site location is shown on Figure 1.

2.2 Site Conditions

The current site conditions consist of an abandoned residential dwelling with agricultural accessory buildings occupying the northwest corner of the property. The site is mainly treed.

An existing un-named tributary of Bothwell's Creek flows south to north along and through the eastern portion of the site. Beyond the site's eastern limit, the creek passes through a 2m x 2m box culvert under 16th Street East and flows north to join Bothwell's Creek. The Owen Sound Rail Trail and cycling route to the east of the site also passes under 16th Street East through a larger 6m x 4m box culvert. The larger box culvert acts as an overflow spillway under major storm events, when the smaller culvert is inundated.

The area available for development on the site has been limited by the extent of the Regional Storm Flood Event. A Floodplain Analysis Report was completed by GM BluePlan in March 2021 to provide calculations and modelling to confirm the expected floodline elevations in the area of the site. The resulting floodplain elevation of 229.75masl, complete with Grey Sauble Conservation Authority (G.S.C.A) 6m set back has left a 2.53 ha area in the northwest portion of the site and a 0.2 ha area in the southeast portion (as shown on SP1 of GM BluePlan report).

This report will focus on servicing the 2.53 ha area of developable land to the northwest. The existing topography in this area slopes southeast to the un-named tributary of Bothwell's creek with an average slope of 3.5% across the site.

2.3 Subsurface Conditions

A Geotechnical Investigation was completed by GMBP in April of 2021 under separate cover.

In general, a surficial layer of black topsoil and organic material was encountered across the site at depths of 0.2m to 0.4m. The topsoil was underlain by a clayey silt with varying amounts of sand and gravel with a thickness of approximately 1.2 m to 2.8 m. Beneath the silty clay soils was a sandy silt with a little clay and no gravel and then deeper was a clayey silt till.

It should be noted that due to the clayey silt soils encountered, there will be little infiltration into the native subsoils. As such, infiltration should not be considered an acceptable drainage outlet.

2.4 Proposed Development

The proposed development consists of residential and commercial spaces. The northern portion of the site is to be developed with four (4) buildings for commercial spaces with a central parking lot. The southern and eastern portions of the lot is proposed to consist of three (3) residential multi-unit residential buildings and one (1) commercial building based on the most recent conceptual site plan supplied to GMBP by G.M. Diemert Architect Inc. Parking is proposed in the basement level of the residential buildings as well as on the westerly side of the buildings.

Conceptual Servicing Plan for reference is shown on Figure 1A

2.5 Site Access

The City of Owen Sound has previously noted that the subject property is to have site access through the existing adjacent development to the west of the site. An additional entrance from 16th Street East would not be approved. As such, the site access is shown as via a driveway entrance to the property to the west.

Pedestrian access will be via sidewalks to the site from 16th Street East.

3. SANITARY SERVICING

3.1 Background/Existing Infrastructure

The City of Owen Sound completed the Sydenham Heights Sanitary Sewer expansion in 2018. The 600mm diameter trunk sanitary sewer drains from south to north along the County owned rail trail to the east of subject property.

The design of the sewage works was completed by GM BluePlan and included the subject property in the catchment area for the sewer. Included in Appendix A, please find the Sanitary Sewer Design Sheet from the Sydenham Heights Sanitary Sewer project, along with the drainage area plan for reference. The design sheet notes the subject property as part of sanitary Catchment area 5 and is allocated 5.8L/s as a 3ha commercial property.

Sanitary drainage from the proposed development will ultimately drain to the Owen Sound Wastewater Treatment Plan located on the eastern shore of Georgian Bay on 3rd Avenue East via the Sydenham Heights Sanitary sewer system.

3.2 Sewage Demands

To estimate the peak flow, we have assumed the following:

Table 1 – Sanitary Peak Flow Calculations

Commercial equivalent Population	= 100 persons/ha (1)
(CEP)	= 100 persons/ha x 1.32ha
	= 132 persons
Site Area (commercial)	= 1.32ha
Average Flow (Q)	= 400L/capita/day
Peak Extraneous Flows (I)	= 0.20L/ha/s
Harmon Peaking Factor (M)	= $1+(14/(4+(CEP/1000)^{0.5}))$(1)
	= $1+(14/(4+(132/1000)^{0.5}))$(1)
	= 4.209
Peak Flow	= (MxQxCEP/1000)/86.4+IA
	= (4.209x400x(132/1000)/86.4+0.2x1.32
	= 2.84L/s
Residential Equivalent Population	= 2.3 persons per unit(1)
(REP)	= 2.3x 120 units
	= 276 persons
Site Area	= Total area of developable land – commercial
	= 2.53ha – 1.32ha
	= 1.21ha
Average Flow (Q)	= 400L/capita/day
Peak Extraneous Flows (I)	= 0.20L/ha/s
Harmon Peaking Factor (M)	= $1+(14/(4+(REP/1000)^{0.5}))$(1)
	= $1+(14/(4+(276/1000)^{0.5}))$(1)
	= 4.09
Peak Flow	= (MxQxREP/1000)/86.4+IA
	= (4.09x400x(276/1000)/86.4+0.2x1.21
	= 5.47L/s
Combined Peak Flow	= Commercial and Residential Peak Flow
	= 2.84L/s + 5.47L/s
	= 8.31L/s

[1] Taken from The City of Owen Sound Subdivision Policies and Engineering Design Standards, revised June 2021.

3.3 Proposed Sanitary Sewer/Infrastructure

Since there were not any sanitary service connections provided to the subject property as part of the Sydenham Heights Servicing Extension, it is proposed to install a new precast manhole on the existing 600mm diameter mainline sanitary sewer. A new 250mm diameter service will connect to the new manhole to service the commercial/residential property with sufficient capacity to convey the design loading to the City sewer. The proposed sanitary service connection is shown as Figure 2 of this report.

As noted in Section 3.2, the required peak sanitary flow for residential and commercial is 8.31 L/s which is slightly more than the 5.8L/s allocated to this property in the design of the Sydenham Heights Servicing Extension. The increase is the result of the proposed residential units instead of commercial uses.

To justify this increase in peak design flow to the system we note the Sydenham Heights Servicing Extension design has 450L/cap/day whereas the newly issued City design standards require 400L/cap/day to be used resulting in a 21.1L/s surplus in the Sydenham Heights sanitary design.

Ultimately, the design of the sanitary sewer extension is planned to service a large area and there is little use at this time. It is unlikely all developments will proceed and unlikely they will all be at capacity. Given the conservative design calculations, the slight exceedance should be considered acceptable, as justified above.

The Owen Sound Wastewater Treatment Plant located on the eastern shore of Georgian Bay on 3rd Avenue East has a capacity of 24,545 m^3/day and has been confirmed to be operating at approximately 50% capacity, based on correspondence with City Staff. Based on the operational capacity of the plant and the existing infrastructure available adjacent to the site, there is adequate capacity to service the proposed development.

4. WATER SUPPLY AND DISTRIBUTION

4.1 Existing Water Infrastructure

There is a 300mm diameter PVC DR18 watermain within a municipal easement located on the commercial property to the west. The static pressure noted on the City of Owen Sound Water Plat 18 for hydrant 1-c-202 (located 10m West of subject property) is 58psi.

4.2 Proposed Infrastructure

The commercial/residential development will be serviced with municipally treated water. A single 250mm diameter connection will be made to the existing 300mm diameter watermain as shown on SP1 appended to report. This service will loop internally to provide domestic to the proposed buildings. Additional site fire hydrants will be required to meet OBC requirements.

4.3 Water Demands Assessment

Calculations of the water demand for the proposed development have been determined using the guidelines outline within Owen Sound's Subdivision Policies and Engineering Design Standards (June 2021), and the Ministry of the Environment, Conservation and Parks (MECP) Design Guidelines for Drinking-Water Systems (May 2019).

The Owen Sound Design Standards do not specify and Average Flow/capita/day or the persons per unit for design purpose, and for consistency, the average sanitary demands of 400L/cap/day and 2.3 persons per unit were used.

In order to convert the average daily demands into maximum daily and peak hourly flows, a peaking factor was applied. The peaking factor was in accordance with Table 3-3 of the MECP design guidelines, resulting in a maximum day factor 3.0 and a peak hour factor of 4.5.

Table 2 – Watermain Maximum Day Demand and Fire Flow Calculations

Commercial equivalent Population	= 86 persons/ha (1)
(CEP)	= 86 persons/ha x 1.32ha
	= 113.52 persons
Residential equivalent Population	= 2.3 persons per unit(1)
(REP)	= 2.3x 120
	= 276 persons
Average Day Demand (ADD)	= (CEP+REP) x Average daily demand per person
	= (113.52+276) x 400L/day
	= 389.52 x 400L/day
	= 155,808L/day
	= 155.81m^3/day
	= 1.80L/s
Peak Hour	= ADD x Peak hour factor
	= 155.81m^3/day x 4.5
	= 701.14m^3/day
	= 8.11L/s
Maximum Day Demand (MDD)	= ADD x Maximum daily factor
	= 155.81m^3/day x 3.0
	= 467.43m^3/day
	= 5.41L/s
Fire Flow (FF)	= 85L/s
MDD + FF	= 5.17L/s + 84L/s
	= 89.41L/s

Fire flow calculation completed per Fire Underwriter Survey (1999) Water Supply for public Fire protection. A detailed calculation is included in Appendix B of this report. Each proposed building was analyzed with Building F-1 resulting in the highest fire flow demand.

4.4 Water Capacity

The water service through the site is proposed to be a 250 mm diameter watermain to service the hydrants on the subject property. As per the appended Water Service Friction Headloss calculations, there would be a minimal friction headloss of 4.7 psi through the entire water service length during the fire flow conditions. Based on the static water pressure of 58 psi, there would still be more than 50 psi of pressure in the system.

Fire flow supply to each building is to be confirmed by the building mechanical engineer at the time of detailed design and sprinkler design (if necessary). In addition, a hydrant flow test adjacent to the site is to be completed to ensure the fire flow is available from the City's watermain system, since it is from one source through the adjacent property and is only 58 psi at static pressure.

The proposed development will have an Average Day Demand (ADD) of 155.81m^3/day and Maximum Day Demand (MDD) of 467.43m^3/day based on the combined (commercial and residential) equivalent population of 390 persons.

The City's existing water treatment plant has a capacity of 27,300m^3/day and is operating at approximately 50% capacity as per correspondence from the City. Based on the operational capacity of the plant and the existing infrastructure available adjacent to the site, sufficient water supply to provide potable water to the proposed commercial/residential development is available.

The preceding calculations are intended to justify the sizes of the development's proposed water services only for the purposes of supporting a zoning application. Interior Plumbing design is expected to be completed by a licensed plumber at the time of a Building Permit application.

5. STORMWATER MANAGEMENT

5.1 Existing Conditions And Drainage

Under existing conditions, the 2.46 ha property is undeveloped and has generally pervious ground cover with the exception of the buildings. The northwesterly corner of the property is elevated such that all run off from the subject property drains easterly to the Rail Trail and then northerly towards the West branch of the Bothwell Creek watershed. The existing condition drainage area plan is shown as Figure 3.

5.2 Allowable Release Rate

The Owen Sound East Side Master Servicing Stormwater Management Study (ESMSS) was prepared in 2008 by R.J. Burnside and Associates to review and determine the appropriate stormwater management controls for the east side of Owen Sound. The ESMSS provides unit flow rates for all properties based on a per hectare basis.

Using the developable portion of the property of 2.46 ha, the allowable release rate can be calculated, as shown in Table 3 below.

Table 3 – Pre-Development Allowable Release Rate Calculation

	2 yr	5 yr	25 yr	100 yr
Unit Flow Rates Per ESMSS (m^3/s/ha)	0.0074	0.012	0.021	0.029
Pre-Development Allowable Release Rate for 2.46 ha Subject Property (m^3/s)	0.018	0.030	0.052	0.071

Stormwater runoff from the subject property under post-development conditions to the tributary of Bothwell Creek, are to be attenuated to less than, or equal to, the pre-development conditions peak flow rates shown in Table 3. It should be noted that for a property of this size, the allowable release rates are quite low. Given the proposed level of development, significant stormwater quantity storage will be required.

5.3 Design Criteria

Based on the existing site drainage conditions and requirements of the City, the SWM criteria used to develop the appropriate SWM approach for the proposed development are as follows:

1. The design is to be based on the unit flows determined by the authors of the East Owen Sound Master Servicing Study

2. On-site quality control for the storm water flow is to achieve an 80% long term Total Suspended Solids (TSS) removal rate prior to the release to the off-site receiving drainage system.

3. Storm Water run off from building roofs is generally considered “clean” and therefore, additional quality control measures are not required for roof top runoff.

4. Due to the soil conditions, infiltration into the subsoils will not be possible.

5. Storm runoff directly discharged to natural watercourses is to incorporate temperature equalization measures to protect the natural environment.

5.4 Conceptual Stormwater Management Design

Preliminary stormwater modelling undertaken to prepare the conceptual storm water management design. To keep data consistent in relation to the East Owen Sound Master Servicing Study the same rainfall depths and the SCS 6-hour type II storm parameters were used.

Under Post Development conditions, the 2.46 ha subject property is proposed with six (6) buildings. The parking/driving areas around the buildings and at the centre of the site will be mostly paved. With the increase in the imperviousness, the runoff draining easterly towards the tributary to Bothwell Creek greatly increases. The post-development drainage area plan is shown as Figure 4.

To attenuate the increased runoff to the allowable release rates, a 60m x 25m x 1.60m stone storage gallery is proposed to be installed under the middle of the parking area. In addition, Rooftop ponding is also to be utilized on top of the three (3) easterly residential buildings. The two catchments in-between the residential buildings will also drain to small attenuation ponds to mitigate and achieve the desired flow before final discharge at these two (2) main outlet locations.

An emergency overland flow route is proposed within the South Easterly and North Easterly corners of the parking area. This will permit runoff to spill from the parking area before the parking lot ponding depth exceeds 0.3m.

An oil/grit separator (OGS) unit is proposed to be installed upstream of the outlets from the subject property. This OGS unit will provide storm water quality treatment for runoff from a majority of the site prior to discharging to the tributary of Bothwell Creek.

6. SUMMARY

Based on the preceding calculations and provided information:

- Proposed sanitary servicing works are expected to be sufficiently sized including:
    - The proposed 250 mm Ø sanitary service proposed to connect to the existing sanitary sewer located on Grey County Rail trail.,
    - the required peak sanitary flow for residential and commercial is 8.31 L/s which is slightly more than the 5.8L/s allocated to this property in the design of the Sydenham Heights Servicing Extension. Due to the conservative design of the trunk sewer, this is considered acceptable.
- Proposed water servicing works are expected to be sufficiently sized including:
    - The proposed 250 mm Ø main water service connecting to the existing 300 mm Ø watermain in the municipal easement in west commercial property, in order to service the development.
    -
- Stormwater management is to be provided to address quantity and quality requirements.
    - Post development peak flow rates discharging from the subject property to the tributary to Bothwell Creek, are expected to be attenuated to less than that of the pre-development conditions peak flow rates for all design storm events.
    - An emergency overland flow route is proposed within the Southwesterly and North easterly corners of the parking area. This will permit runoff to spill from the parking area before the parking lot ponding depth exceeds 0.3m.
    - An enhanced level of storm water quality treatment with an 80% TSS removal rate is expected to be provided via an OGS unit prior to discharging from the subject property.
    - By providing an underground stone storage gallery, temperature equalization will be provided prior to runoff draining from the site.

All of which is respectfully submitted,

GM BLUEPLAN ENGINEERING LIMITED

Prepared by:

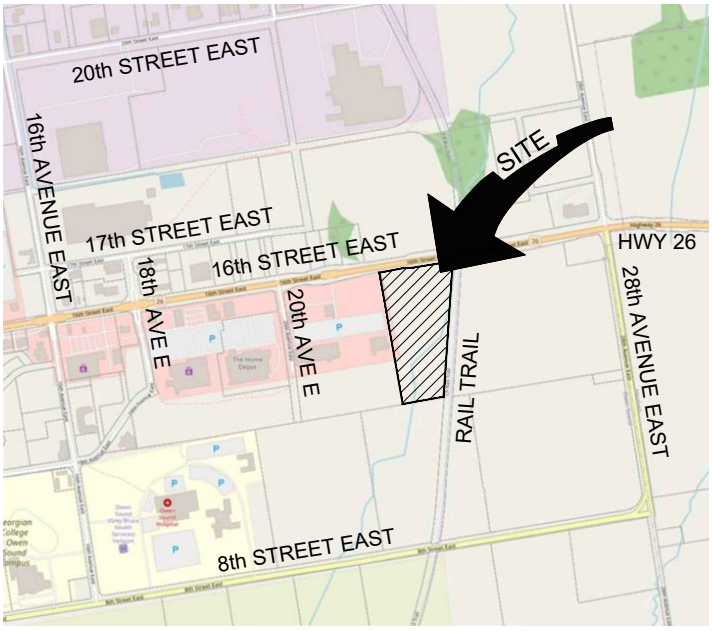
Tyler Jahnke, C. Tech.

Reviewed by:

Ian E. Eriksen, P.Eng.

FIGURES

219112
2275 16th Street East
City of Owen Sound



CITY OF OWEN SOUND
KEY PLAN
NOT TO SCALE

Scale = N.T.S.
NOVEMBER 2022

SITE LOCATION KEY PLAN

SYDENHAM SQUARE
EXQUISITE REAL ESTATE
HOLDINGS LTD.

Figure No. 1

BluePlan ENGINEERING

16th STREET EAST

HIGHWAY No. 26

EX. EDGE OF PAVEMENT

ROAD WIDENING

SANMH4

74.5m–250mmø PVC SAN @ 1.08%

SANMH103

27.0m–250mmø PVC SAN @ 4.74%

SANMH102

30.5m–250mmø PVC SAN @ 2.35%

SANMH101

7.5m–250mmø PVC SAN @ 4.29%

SANMH1

EX. 600mm SANITARY

250mmØ DR18 WATERMAIN

BF

250mmØ DR18 WATERMAIN

85.5m–250mmø PVC SAN @ 0.96%

STORMWATER MANAGEMENT UNDERGROUND STORAGE (TO BE DESIGNED)

SANMH105

EX MH

BENCHMARK No. 1
ELEV 234.79

SANMH108

250mmØ DR18 WATERMAIN

33.0m–250mmø PVC SAN @ 2.72%

66.5m–250mmø PVC SAN @ 0.32%

SANMH106

50.0m–250mmø PVC SAN @ 0.57%

SANMH107

750mmø CONCRETE SANITARY SEWER @ 0.06%

EX. 750mm

GSCA 6m HAZARD SETBACK FROM POST DEVELOPMENT FLOODLINE

OUTDOOR COMMON AREA ABOVE ENTRANCE TO PARKING

EX MH

EX MH

VALUE VILLAGE

STORMWATER MANAGEMENT POND (TO BE DESIGNED)

PRIMARY STORM SEWER DRAINAGE OUTLET

DR–35 SANITARY SEWER @ 0.24%

GMBP FILE:219112 SP-2.dwg, LAYOUT:Fig 1A-SERV
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219112
2275 16th Street East
City of Owen Sound

LEGEND

Scale = 1:1000
NOVEMBER 2022

CONCEPTUAL SERVICING PLAN

SYDENHAM SQUARE
EXQUISITE REAL ESTATE HOLDINGS LTD.

Figure No. 1a

BluePlan ENGINEERING

219112
2275 16th Street East
City of Owen Sound

16th STREET EAST

HIGHWAY No. 26

+235.26
+235.09
+234.95
+233.88
+233.90
+232.92
+232.92
+231.03
+228.92
+229.18
+229.37
+228.51
+228.15
+228.08
+227.69
+227.86
+227.81
+227.51
+227.30
+232.92
+233.01
+228.82
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+228.34
+226.79
+228.45
+228.08
+228.40
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+227.37
+227.83
+227.56
+227.21
+226.99
+226.94
+227.54
+226.62
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+228.62
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+228.59
+227.27
+226.89
+227.94
+228.35
+228.08
+228.03
+228.04
+227.71
+228.41
+228.18
+228.12
+228.04

SANMH100
T/G 227.81
INV S 224.98
INV W 225.50
INV N 224.98

DOGHOUSE SANITARY MANHOLE AND BREAK INTO EX. SANITARY SEWER

SANMH50

NEW MH
T/G 227.80
INV N 224.98
INV S 224.99

EX MH
T/G 228.14
INV N 225.33
INV S 225.35

77.5m–250mmø PVC SAN @ 4.29%

EX. 600mmø OD PE DR-11 SANITARY SEWER @ 1.54%

EX. 6050mm x 4000mm CONC. RIGID FRAME BOX UNDERPASS

EX. 2000 x 2000mm CONC. RIGID FRAME BOX CULVERT

EX. 600ø OD PE DR-11 SAN SEWER @ 1.54%

EX. 750ø CONC. SAN SEWER @ 0.06%

C/L EXISTING WATERCOURSE

C/L EXISTING WATERCOURSE

Scale = 1:250
NOVEMBER 2022

PROPOSED SANITARY SERVICING

SYDENHAM SQUARE
EXQUISITE REAL ESTATE HOLDINGS LTD.

Figure No. 2

BluePlan ENGINEERING

GMBP FILE:219112 SP-2.dwg, LAYOUT:Fig 1-San Servicing
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16th STREET EAST

HIGHWAY No. 26

EX. EDGE OF PAVEMENT

ROAD WIDENING

6m FRONT YARD SETBACK

233.01

E
2
C
E
C

10
2.46 ha
7%

BENCHMARK No. 1
ELEV 234.79

POST DEVELOPMENT
FLOODLINE LIMIT 229.75m

GSCA 6m HAZARD SETBACK
FROM POST DEVELOPMENT
FLOODLINE

CURRENT POST
DEVELOPMENT
FLOODLINE 229.75m

OUTDOOR COMMON AREA
ABOVE ENTRANCE TO
PARKING

PROPOSED POST
DEVELOPMENT FLOODLINE
LIMIT 229.75m. 40m³ OF FILL
REQUIRED-SEE HATCHED AREA

APPROXIMATE LIMIT OF
GRADING AT 5:1 SLOPE

VALUE
VILLAGE

PROPOSED POST
DEVELOPMENT FLOODLINE
LIMIT 229.75m. 40m³ OF CUT

219112
2275 16th Street East
City of Owen Sound

N

LEGEND

10
0.37 ha
0%

CATCHMENT #
DRAINAGE AREA
% IMPERVIOUS

DRAINAGE AREA BOUNDARY

Scale = 1:1000
NOVEMBER 2022

PRE-DEVELOPMENT DRAINAGE CONDITIONS

SYDENHAM SQUARE
EXQUISITE REAL ESTATE
HOLDINGS LTD.

Figure No. 3

BluePlan ENGINEERING

GMBP FILE:219112 SP-2.dwg LAYOUT:FIG3-PRE
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16th STREET EAST

HIGHWAY No. 26

EX. EDGE OF PAVEMENT

ROAD WIDENING

6m FRONT YARD SETBACK

EX. 600mm SANITARY

EX MH

750mmø CONCRETE SANITARY SEWER @ 0.06%

EX 750mm

DR-35 SANITARY SEWER @ 0.24%

EX MH

EX MH

107
0.09ha
70%

103
0.11 ha
100%

200
1.63 ha
85%

106
0.09 ha
75%

102
0.11 ha
100%

105
0.05 ha
95%

101
0.11 ha
100%

104
0.27 ha
50%

BF

GSCA 6m HAZARD SETBACK FROM POST DEVELOPMENT FLOODLINE

OUTDOOR COMMON AREA ABOVE ENTRANCE TO PARKING

VALUE VILLAGE

219112
2275 16th Street East
City of Owen Sound

N

LEGEND

201
0.37 ha
0%

CATCHMENT #
DRAINAGE AREA
% IMPERVIOUS

DRAINAGE AREA BOUNDARY

Scale = 1:1000
NOVEMBER 2022

POST-DEVELOPMENT DRAINAGE CONDITIONS

SYDENHAM SQUARE
EXQUISITE REAL ESTATE HOLDINGS LTD.

Figure No. 4

BluePlan ENGINEERING

GMBP FILE:219112-SP-2.dwg, LAYOUT:Fig 4-POST
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APPENDIX A:
SYDENHAM HEIGHTS SANITARY SEWER DESIGN BRIEF

SANITARY SEWER DESIGN SHEET

q = average daily per capita flow
i = unit of peak extraneous flow
M = peaking factor
Q(p) = peak population flow (L/s)
Q(c) = commerical land flow (L/s)
Q(i) = peak extraneous flow (L/s)
Q(d) = peak design flow

Assumptions and Considerations

DESIGN FLOWS

Domestic Flows =	**450**	*L/cap/day*
Commercial Flows =	**5000**	*L/ 1000 m^2 / dav*
	8	*Commercial Hours/ day*
Infiltration Flows =	**0.20**	*L/ha/s*

RESIDENTIAL DENSITIES

Low Density Residential =	**25**	*Units/ ha*
Medium Density Residential =	**50**	*Units/ ha*
High Density Residential =	**100**	*Units/ ha*
Escarpment Density =	**2.0**	*Units/ Lot* *
Number of People per Units =	**2.3**	*People/ Unit*

M = 1 + 14 / [4 + (P)^1/2]
where P = population in 1000's

Q(p) = PqM (L/s)
Q(c) = qA
Q(i) = IA (L/s) ; where A = area in hectares
Q(d) = Q(p) + Q(c) + Q(i) (L/s)

SANITARY CATCHMENT	LOCATION			INDIVIDUAL										CUMULATIVE							SEWER DATA							
				Residential						Commercial	Hazard Lands/ Open Space/ Rail Trail	Escarpment Rural/ Escarpment Protection																	
				Low Density		Medium Density		High Density																					
	Street/ ROW	Starting Node	Finishing Node	Area (ha)	Pop.	Area (ha)	Pop.	Area (ha)	Pop.	Area (ha)	Area (ha)	Area (ha)	No. of Lots	Pop.	Pop.	Comm. Area (ha)	Infil. Area (ha)	Peaking Factor M	Pop. Flow Q (p) (L/s)	Comm. Flow Q (c) (L/s)	Peak Extraneous Flow Q (i) (L/s)	Peak Design Flow Q (d) (L/s)	Pipe Material	Roughness Coefficient (n)	Diameter (mm)	Slope (%)	Length (m)	Capacity Q_{full} (L/s)	Full Flow Velocity (m/s)	Actual Velocity at Q (d) (m/s)
1	8th St E	A	B	12.9	742	33.6	3864	11.1	2553	2.2	13.4	32.3	4	18	7177	2.2	105.5	3.10	115.74	3.82	21.10	140.7	PVC	0.013	600	0.2	95	274.6	0.97	0.97
																							HDPE DR-11	0.013	492	1.0	50	361.7	1.90	1.78
																							PVC	0.013	600	0.2	285	274.6	0.97	0.97
2	Rail Trail	B	C	62.2	3577	0.0	0	1.4	322	0.0	29.6	35.7	5	23	11099	2.2	234.4	2.91	168.19	3.82	46.88	215.1	PVC	0.013	600	0.3	466	336.3	1.19	1.26
3,4	Rail Trail	C	D	2.0	115	4.0	460	4.9	1127	7.1	10.8	0.0	0	0	12801	9.3	263.2	2.85	189.84	16.15	52.64	242.5	PVC	0.013	600	0.3	382	336.3	1.19	1.29
5	Rail Trail	D	E	0.0	0	0.0	0	0.0	0	3.0	0.0	0.0	0	0	12801	12.3	266.2	2.85	189.84	21.35	53.24	243.1	HDPE DR-11	0.013	492	1.0	100	361.7	1.90	2.04

NOTES:

* NEC Planning is expected to allow for 1 Single Dwelling per lot; 2 Single Dwellings per lot was considered for conservative design purposes

DESIGNER: JS & AW

DATE: FEBRUARY 2017

PROJECT: Sydenahm Heights Sanitary Sewer ECA

PROJECT NO: 216082

SHEET NO:
1 of 1

APPENDIX B:
FRICTION HEADLOSS CALCULATIONS

Servicing Feasibility Study
Telfer Creek Square
City of Owen Sound
Our File: 219112
February 2022

Water Service Friction Headloss Calculations

Location	Peak Flow Rate (L/min)	Peak Flow Rate (L/s)	Pipeline Diameter (mm)	Flow Rate (L/s)	Flow Velocity (m/s)	Pipeline Length (m)	Friction Headloss (m/m)	Friction Headloss (m)	Friction Headloss (kPa)	Friction Headloss (psi)
Proposed On-Site Watermain	5340.0	89.0	250	89.0	1.81	194	0.02	3.3	32.6	4.7

Notes for Water Flow Calculations

1. Peak Flow Rate to be determined by Hydraulic Loads for Fixtures as outlined in Ontario Building Code

2. Hazen-Williams Roughness Coefficient

150 mm	=	100
200-250 mm	=	110
300 - 600 mm	=	120
Over 600 mm	=	130

3. Hazen Williams Formula

$$h_L = \frac{10.67 * L * Q^{1.85}}{C^{1.85} * d^{4.8655}}$$

where:
h_L = head loss (m)
L = Length of pipe (m)
C = Hazen Williams coefficient (-)
Q = Peak flow (m^3/s)
D = Diameter of pipe (m)

BluePlan ENGINEERING

REQUIRED FIRE FLOW

Water Supply for Public Fire Protection (FUS 1999)

Project:	Telfer Creek Square
File No.:	219112
Designer:	TJ
Address:	2775-16th Street East
Desciption:	Conceptual site plan by G.M. Diemert Architect Inc., dated November 9, 2021.

$F = 220 \times C \times \sqrt{A}$

F = Required fire flow (LPM)
C = Coefficient related to type of construction
A = Total floor area (including all storeys but excluding any basement levels at least 50% below grade.)

Type of Construction: Multi residential 38 units - precast concrete

Desciption: Building F-1 — 3 Floors. Basement floor parking. No combustables

C= 0.80

Floor Area:	1080m^2	**Area:**	2160.00
Number of Storeys:	3	**Description:**	2 floors used. Basement parking excluded
Fire Resistant Building?	yes		
Vertical Openings and Exterior Vertical Communications protected with minimum one (1) Hour rating:	Y/N	**Required Fire Flow:**	8180 8000 L/min
Occupancy Charge:	-25%		
Fire Flow Reduction:	-25%	**OR**	2000 L/Min
Required Fire Flow:	6000 L/min	**L/Min**	

Automatic Sprinkler Protection: Yes

Designed to NFPA 13 Standard: Yes -30%

Standard Water Supply to Sprinklers and Standpipes: Y/N

Fully Supervised System: Y/N

Fire Flow Adjustment: 4200 L/min

Exposure 1 (North)	Distance:	m	Charge:	%
Desription:				
Exposure 2 (East)	Distance:	m	Charge:	%
Description:				
Exposure 3 (West)	Distance:	19.6m	Charge:	15%
Description:	Building "C" commercial			
Exposure 4 (South)	Distance:	30.1m	Charge:	5%
Description:	Residential building F-2			

Total Exposure Charge: 20% **Fire Flow Adjustment:** 840

Total Required Fire Flow: 5040 L/min 84 L/s