



November 25, 2022

Via: Email

**Innovative Planning Solutions
647 Welham Road, Unit 9
Barrie, Ontario
L4N 0B7**

ATTN: Cameron Sellers

**Re: Site Servicing Design Brief
30 Sophia Street West, City of Barrie
WMI File No.: 22-770**

Dear Mr. Sellers,

WMI & Associates Limited has been retained by Solid General Contractors Inc. to prepare a Site Servicing Design Brief in support of the proposed mixed-use multi-residential and commercial development located at 30 Sophia Street West in the City of Barrie.

The assessment presented herein is based on City of Barrie standards and design guidelines as they relate to water and sanitary servicing and grading requirements. Stormwater management for the proposed development are discussed in the Stormwater Management Report.

Overview

The Site consists of 0.24 ha (2365m²) with Mary Street to the west, Sophia Street West to the south, an occupied single family residential lot to the north (11 Mary Street) and two residential buildings used as commercial space to the east (18 Sophia Street West and 102 Maple Avenue). The western portion of the property contains the existing mechanic shop / commercial building and associated parking areas. The eastern portion of the site is primarily soft scape with some trees and a drainage swale.

It is proposed to re-develop the Site to a mixed-use building with ground level commercial space and 39 residential units complete with rooftop amenity area and underground parking. The Site Plan prepared by Paradigm Architecture + Design is in **Appendix A**.

The City of Barrie is currently undertaking the design for the reconstruction of municipal infrastructure surrounding the Site under the Queen's Park Neighbourhood Renewal project. Please note that we have included the existing municipal infrastructure and the proposed renewal project infrastructure for reference purposes.

Water Servicing

The Site is currently serviced by a 25mm diameter domestic water service and a fire water service (size unknown) which are connected to the existing municipal watermain on Sophia Street.

The City standard for fire supply is that the minimum supply of water shall be provided in accordance with land use designation, or the supply be in accordance with the Fire Underwriter's Survey (FUS) demand calculation; whichever is greater.

Based on non-combustible construction the FUS calculation determined a required demand of 101L/s, and in accordance with City land designation the fire demand was calculated to be 210L/s. Therefore the 210L/s fire flow governs for the site as it is greater than the fire flow calculated under FUS.

Since the City of Barrie is proposing to remove and replace the existing 100mm diameter municipal watermain on Sophia Street with a 200mm diameter watermain it is of no purpose to support the proposed design by completing a fire flow test until the municipal renewal project is complete. Therefore, WMI has completed a water model analysis using EPANET2.2 software to determine if the City's proposed water system is able to support the proposed development.

The proposed fire flow + MDD of 211.41L/s was used in the water model to determine the impact on the City's water system as it relates to maintaining a minimum water pressure of 20psi throughout the system and a pipe velocity of less than 3.0m/s. The model included 6 nodes and 6 links in the immediate area of the proposed development which were deemed critical for the analysis. Summary as follows:

1. Junction #TCV-G15_ND, located south of the Wellington Street and Mary Street intersection, was determined to have the lowest residual pressure of 15.06m of head (21.4psi). The residual pressures in the remaining 5 nodes range from 16.32m-27.83m of head (23.2-39.6psi).
2. Link # L-0285, located on Sophia Street between Mary Street and Ross Street was determined to have the greatest velocity (2.84m/s). Velocities at the remaining critical links are in the range of 0.68m/s – 2.38m/s.

Based on our analysis the Queen's Park Neighbourhood Renewal Project design will accommodate the proposed development.

Per our design calculations it is proposed to service the proposed building with a 150mm diameter fire connection and a 100mm diameter water service from the municipal watermain on Sophia Street.

Supporting calculations and model output is included in **Appendix B**. The Site Servicing Drawing is included in **Appendix A**.

Sanitary Servicing

The site is currently serviced by a sanitary service lateral which connects to the existing 200mm diameter sanitary sewer on Mary Street.

The Architectural building plans indicate 39 residential units and 425m² of commercial area; using City requirements for population density a peak hourly demand of 0.78 L/s was calculated. Based on this calculation a 200mm diameter sanitary connection will be sufficient for the proposed building.

As previously noted, new municipal infrastructure will be installed per the Queen's Park Neighbourhood Renewal Project. It is proposed that the new 200mm diameter sanitary lateral for 30 Sophia Street continue to discharge to the Mary Street sanitary sewer.

Supporting calculations are included in **Appendix B** and the Site Servicing Drawing is included in **Appendix A**.

Site Grading and Drainage

The existing grading of the site is generally from the northeast to the southwest and there is a drainage swale contained within the eastern portion of the site. This swale discharges to an on-site culvert which outlets to an existing storm sewer located under the existing building. There are external drainage areas which outlet to the site via overland flow from the north and east, some of which is collected in the on-site swale and some of the drainage reaches the Mary Street right-of-way. Ultimately all external drainage area currently is collected in existing municipal infrastructure.

The Queen's Park Neighbourhood Renewal Project proposes to remove the existing on-site culvert and on-site drainage swale. Ultimately the renewal project eliminates the easterly municipal right-of-way drainage from entering the existing swale. The proposed grading and drainage for the site is based on the Queen's Park Neighbourhood Renewal Project.

Perimeter landscape area by-pass swales are proposed along the north and east property limits to convey external drainage to Mary Street and Sophia Street. In order to accommodate minor flow from the external drainage area, ditch inlet catchbasins are proposed to connect to the municipal storm sewers on Mary Street and Sophia Street via the internal storm sewer. Localized grading at the ditch inlets will permit overland flows to discharge to the municipal right-of-ways.

The proposed grading within the parking lot supports the design of the stormwater management system and ultimately discharges to the 450mm diameter storm sewer on Mary Street. The proposed elevations of the landscaping along the western edge of the site promotes overload flow to Mary Street and the grading of the landscape area along the southern limit of the site directs overland flow to Sophia Street.

Refer to **Appendix A** for the Site Grading Plan.

Summary

This Servicing Design Brief demonstrates how the proposed development will be serviced by the proposed municipal services as installed per the Queen's Park Neighbourhood Renewal Project.

Specifically,

- Fire and domestic water services connected to the new 200mm diameter watermain on Sophia Street West.
- Sanitary service connected to the new 250mm diameter sewer on Mary Street.
- Site grading will match existing property line elevations and overland drainage will be directed to the Mary Street and Sophia Street right-of-ways.

Based on the information contained within this design servicing brief and the standalone Stormwater Management Report, and as noted on the detailed design drawings, the proposed redevelopment of 30 Sophia Street is supported by the proposed municipal infrastructure.

Respectively submitted,

WMI & Associates Limited



Chris Jungkunz, EIT



Dean A. Ives, P. Eng.

APPENDIX A

FIGURES AND DRAWINGS

MUNICIPAL ADDRESS:	30 SOPHIA STREET W
MUNICIPALITY:	BARRIE, ON
ZONING DESIGNATION:	C2 1.0
LOT AREA	2,345.27 m ²
EXISTING BUILDING AREA:	370.8 m ²
PROPOSED BUILDING AREA:	993.6 m ²
BUILDING GT:	17.2 m
EXISTING GFA:	741.6 m ²
PROPOSED GFA:	3,770.0 m ²
FSI:	1.6
ROOFTOP AMENITY SPACE:	254.0 m ²
NO. OF RESIDENTIAL UNITS:	39
COMMERCIAL GFA:	404m ²
<u>PARKING SPACES:</u>	
<u>SURFACE LEVEL:</u>	19
<u>UNDERGROUND:</u>	27
TOTAL:	46



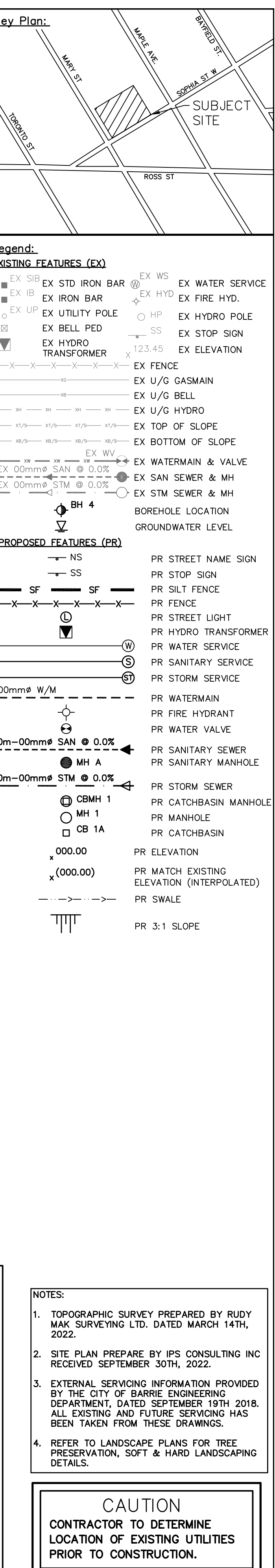
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STAMP:

30 SOPHIA STREET
BARRIE, ON

DRAWN BY: MM	PROJECT NO.: 2000
CHECKED BY: MC	SCALE: As indicated





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APPENDIX B

WATER & SANITARY SERVICING CALCULATIONS



WMI & Associates Limited
119 Collier Street, Barrie, Ontario L4M 1H5
p (705) 797-2027 f (705) 797-2028

**MANNING'S PIPE EQUATION
OUTLET SANITARY SEWER DESIGN**

Date: 19-Oct-22

Project No.: 22-770

Project: 30 Sophia Street West

Prepared By: CJ

Mannings' Equation	
Pipe Diameter (mm) =	200
Area =	0.031 m ²
Slope (%) =	1.00
Manning 'n' =	0.013
Nom'l Pipe Capacity, Q =	0.033 m ³ /sec
Actual Pipe Capacity, Q =	0.034 m ³ /sec
	34.2 L/sec

Box Culvert	
Height =	0.00
Width =	0
Q =	0.00
Velocity	
1.04	m/s
1.09	m/s
R=	0.05
Sf=	0.0100

NOTE: The capacity of the proposed sanitary outlet is in excess of the peak sanitary flows for the development of 0.78L/s.



TOTAL DAILY SANITARY DESIGN FLOW CALCULATIONS

Date: 19-Oct-22

Project No.: 22-770

Project: 30 Sophia Street West

Prepared By: CJ

<<< Elements Requiring Input Information

Total Daily Design Flow Calculations

- References:
- Ontario Building Code (OBC), 2012, Division B, Part 8, Table 8.2.1.3.A. Residential Occupancy & Table 8.2.1.3.B. Other Occupancies
 - Ministry of the Environment (MOE), Design Guidelines for Sewage Works (2008), Chapter 5
 - City of Barrie Sanitary Sewage Collection System Policies and Design Guidelines (2017)

Existing Condition:

Establishment:	# of people	# of water closets	# of fuel outlets	# of seats	Gross Floor Area (m ²)	Land Area (ha)	Total Daily Design Sanitary Sewage Volume	Total Daily Design Sanitary Sewage Flow (L/day)
Commercial/Institutional & Industrial Uses:								
Commercial Block						0.0425	28 m ³ /(ha*d)	1,190
Subtotal =						0.0425		1,190

Peaking Factor = 2
Peak Total Daily Design Sanitary Sewage Flow (L/day) = 2,380
Peak Extraneous Unit Flow (L/s/ha) = 0.00
Land Area (ha) = 0.00
Peak Extraneous Flow (L/day) = 0
Peak Total Daily Design Flow (L/day) = 2,380

Residential Uses:								
Apartment								
39 units @ 1.67 ppu	65						225 L/person	14,625
Subtotal =	65							14,625

Harmon Formula, $M = 1 + \frac{14}{(4 + P^{0.5})}$
where, P = Design population in 1000s

Peaking Factor, M = 4.29
Peak Total Daily Design Sanitary Sewage Flow (L/day) = 62,741
Peak Extraneous Unit Flow (L/s/ha) = 0.10
Land Area (ha) = 0.24
Peak Extraneous Flow (L/day) = 2074
Peak Total Daily Design Flow (L/day) = 64,815

Total Average Daily Design Flow (L/day) =	15,815
Peak Total Daily Design Flow (L/sec) =	0.78

Notes:

The Mixed Use building comprises residential 39 units, as per the architectural plans prepared by Paradigm Architecture + Design plans dated September 23, 2022, and the commercial block area of 425m².
High density population used as per City of Barrie standards.



WMI & Associates Limited
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p (705) 797-2027 f (705) 797-2028

**FIRE PROTECTION WATER STORAGE
DESIGN CALCULATIONS - NON-COMBUSTIBLE CONSTRUCTION**

Date: 07-Oct-22

Project No.: 22-770

Project: 30 Sophia Street

Prepared By: CJ

Fire Protection Water Storage

<<< Elements Requiring Input Information

Reference: Part II Water Supply for Public Fire Protection, Fire Underwriters Survey, 1999

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

where F=the required fire flow in litre per minute

C=coefficient related to type of construction

1.5 for wood frame construction

1.0 for ordinary construction - brick or other masonry wall, combustible floor and interior

0.8 for non-combustible construction - unprotected metal structure components masonry or metals walls

0.6 for fire resistive - fully protected frame floors, roof

A= the total floor area in square metres - incl. all storeys excluding basements 50% below grade

C=	0.8	
A=	3540	
F=	10472	
Apply reduction or surcharge section 2.	-25	% (apartment/store use)
F=	7854	
Apply reduction for automatic sprinklers	50	%
F=	3927	litres/min
F=	65	litres/sec
Add to flow for separation <u>per side</u> where separation is less than 45m. Max increase is 75%	55	%
F=	101	litres/sec

Note: -GFA taken from Site Plan A102 prepared by Paradigm Architecture + Design dated September 23, 2022.

-Apply reduction for automatic sprinklers designed to NFPA 13 (30%), additional reduction for water supply connected system (10%) and systems with electronic supervision (10%).

-Flow for separation calculated based on <10m to east (20%); <20m north (15%); <30m to south and west (10% ea).

-Assumed to follow non-combustible construction.



TOTAL DAILY DOMESTIC WATER DEMAND CALCULATIONS

Date: 07-Oct-22

Project No.: 22-770

Project: 30 Sophia Street West

Prepared By: CJ

<<< Elements Requiring Input Information

Total Daily Design Flow Calculations

References:

- Ontario Building Code (OBC), 2012, Division B, Part 8, Table 8.2.1.3.A. Residential Occupancy & Table 8.2.1.3.B. Other Occupancies
- Ministry of the Environment (MOE), Design Guidelines for Drinking-Water Systems (2008), Chapter 3
- City of Barrie Water Transmission and Distributions Design Standard (Feb 2022)

Proposed Condition:

Establishment:	# of people	# of water closets	# of fuel outlets	# of seats	Gross Floor Area (m ²)	Land Area (ha)	Total Daily Design Volume	Avg Day Demand ADD (L/s)	Max Day Demand MDD (L/s)	Peak Hourly Demand PHD (L/s)
Commercial/Institutional & Industrial Uses:										
Commercial Block						0.0425	28 m ³ /(ha*d)	0.01	0.03	0.06
Subtotal =						0.0425		0.01	0.03	0.06
Peaking Factor =									2.0	4.5
Residential Uses:										
Apartment							L/person	0.00	0.00	0.00
39 units @ 1.67 ppu	65						L/person	0.17	1.38	2.08
Subtotal =	65							0.17	1.38	2.08
Peaking Factor =									8.2	12.3

Total flows:	0.18	1.41	2.14
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Notes:

The Mixed Use building comprises residential 39 units, as per the architectural plans prepared by Paradigm Architecture + Design plans dated September 23, 2022, and the commercial block area of 425m².
High density population used as Per City of Barrie standards.

Nodes

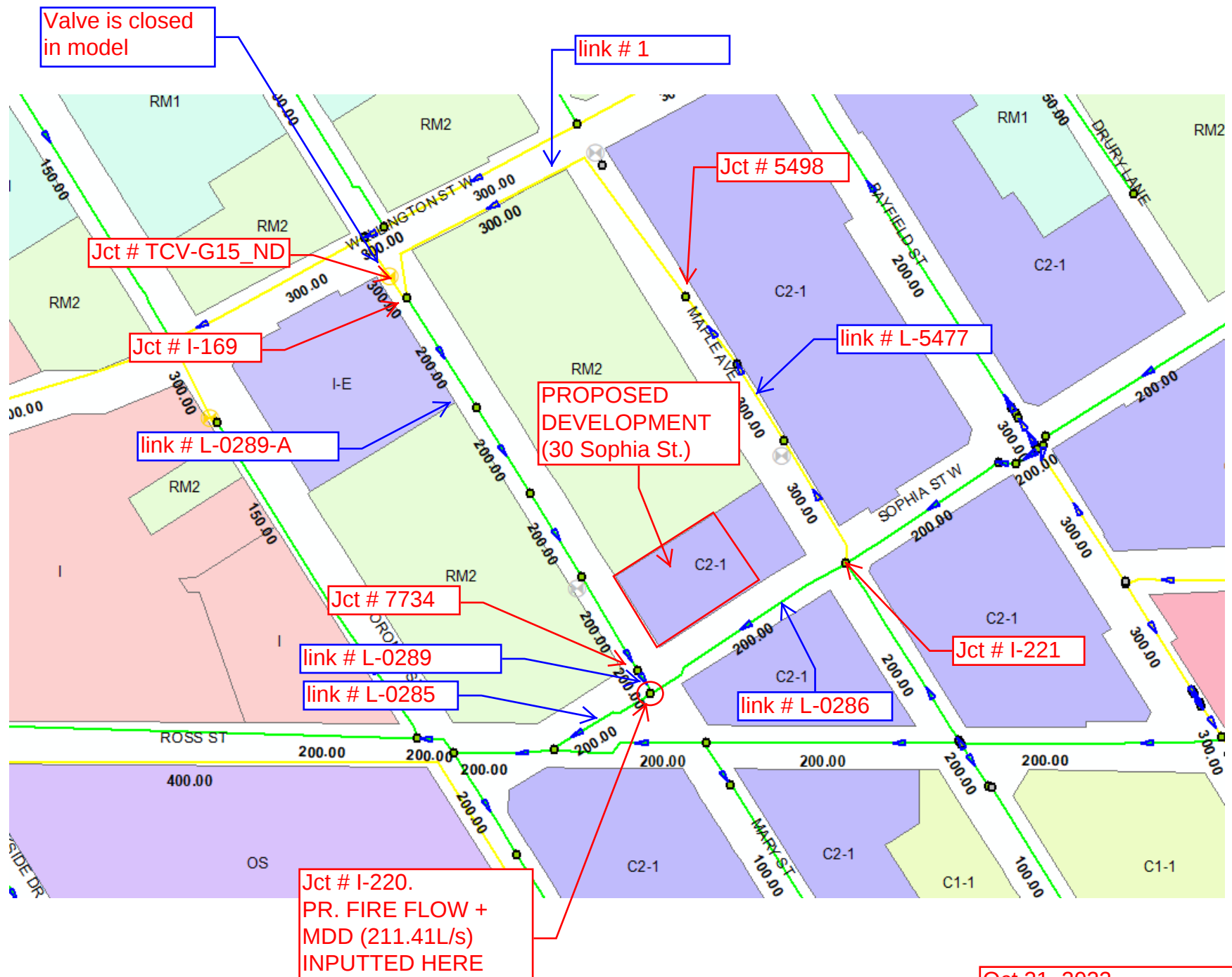
Junction TCV-G15_ND		Junction 1-169		Junction JUNC-7734	
Property	Value	Property	Value	Property	Value
*Junction ID	TCV-G15_ND	*Junction ID	1-169	*Junction ID	JUNC-7734
X-Coordinate	603844.403	X-Coordinate	603852.596	X-Coordinate	603959.236
Y-Coordinate	4916322.421	Y-Coordinate	4916312.988	Y-Coordinate	4916140.219
Description	Connecting junction	Description		Description	
Tag		Tag		Tag	
*Elevation	246.680000	*Elevation	245.420000	*Elevation	233.330000
Base Demand	0	Base Demand	0.090000	Base Demand	0.090000
Demand Pattern		Demand Pattern	PATN-1_ORIGINAL	Demand Pattern	PATN-1_ORIGINAL
Demand Categories	1	Demand Categories	1	Demand Categories	2
Emitter Coeff.		Emitter Coeff.		Emitter Coeff.	
Initial Quality		Initial Quality	0.440000	Initial Quality	0.600000
Source Quality		Source Quality		Source Quality	
Actual Demand	0.00	Actual Demand	0.09	Actual Demand	0.36
Total Head	261.74	Total Head	261.74	Total Head	257.86
Pressure	15.06 21.4psi	Pressure	16.32 23.2psi	Pressure	24.53 34.9psi
Quality	0.00	Quality	0.44	Quality	0.60

Junction 1-220		Junction 1-221		Junction JUNC-5498	
Property	Value	Property	Value	Property	Value
*Junction ID	1-220	*Junction ID	1-221	*Junction ID	JUNC-5498
X-Coordinate	603965.082	X-Coordinate	604055.761	X-Coordinate	603982.586
Y-Coordinate	4916129.735	Y-Coordinate	4916189.932	Y-Coordinate	4916312.520
Description		Description		Description	
Tag		Tag		Tag	
*Elevation	233.250000	*Elevation	234.630000	*Elevation	241.040000
Base Demand	211.41	Base Demand	0.070000	Base Demand	0.030000
Demand Pattern		Demand Pattern	PATN-1_ORIGINAL	Demand Pattern	PATN-1_ORIGINAL
Demand Categories	1	Demand Categories	2	Demand Categories	1
Emitter Coeff.		Emitter Coeff.		Emitter Coeff.	
Initial Quality	0.770000	Initial Quality	0.820000	Initial Quality	0.730000
Source Quality		Source Quality		Source Quality	
Actual Demand	211.41	Actual Demand	0.69	Actual Demand	0.03
Total Head	257.63	Total Head	262.46	Total Head	262.13
Pressure	24.38 34.7psi	Pressure	27.83 39.6psi	Pressure	21.09 30.0psi
Quality	0.77	Quality	0.82	Quality	0.73

Pipe L-0289-A		Pipe L-0289		Pipe L-0286	
Property	Value	Property	Value	Property	Value
*Pipe ID	L-0289-A	*Pipe ID	L-0289	*Pipe ID	L-0286
*Start Node	1-169	*Start Node	JUNC-7734	*Start Node	1-221
*End Node	JUNC-7734	*End Node	1-220	*End Node	1-220
Description		Description		Description	
Tag		Tag		Tag	
*Length	203.020000	*Length	12.420000	*Length	109.540000
*Diameter	200	*Diameter	200	*Diameter	200
*Roughness	100	*Roughness	100	*Roughness	100
Loss Coeff.	0.000000	Loss Coeff.	0.000000	Loss Coeff.	0.000000
Initial Status	Open	Initial Status	Open	Initial Status	Open
Bulk Coeff.	-0.430000	Bulk Coeff.	-0.870000	Bulk Coeff.	-0.510000
Wall Coeff.	-0.020000	Wall Coeff.	-0.050000	Wall Coeff.	-0.020000
Flow	47.66	Flow	47.29	Flow	74.88
Velocity	1.52	Velocity	1.51	Velocity	2.38
Unit Headloss	19.08	Unit Headloss	18.81	Unit Headloss	44.06
Friction Factor	0.033	Friction Factor	0.033	Friction Factor	0.030
Reaction Rate	0.00	Reaction Rate	0.00	Reaction Rate	0.00
Quality	0.60	Quality	0.77	Quality	0.77
Status	Open	Status	Open	Status	Open

Pipe L-5477		Pipe 1		Pipe L-0285	
Property	Value	Property	Value	Property	Value
*Pipe ID	L-5477	*Pipe ID	1	*Pipe ID	L-0285
*Start Node	1-221	*Start Node	JUNC-5498	*Start Node	1-045
*End Node	JUNC-5498	*End Node	1-169	*End Node	1-220
Description		Description		Description	
Tag		Tag		Tag	
*Length	145.040000	*Length	177.4	*Length	52.740000
*Diameter	300	*Diameter	300	*Diameter	200
*Roughness	110	*Roughness	110	*Roughness	100
Loss Coeff.	0.000000	Loss Coeff.	0	Loss Coeff.	0.000000
Initial Status	Open	Initial Status	Open	Initial Status	Open
Bulk Coeff.	-0.510000	Bulk Coeff.	-.51	Bulk Coeff.	-0.890000
Wall Coeff.	-0.020000	Wall Coeff.	-.02	Wall Coeff.	-0.050000
Flow	47.77	Flow	47.74	Flow	89.24
Velocity	0.68	Velocity	0.68	Velocity	2.84
Unit Headloss	2.23	Unit Headloss	2.23	Unit Headloss	60.97
Friction Factor	0.029	Friction Factor	0.029	Friction Factor	0.030
Reaction Rate	0.00	Reaction Rate	0.00	Reaction Rate	0.00
Quality	0.73	Quality	0.44	Quality	0.77
Status	Open	Status	Open	Status	Open

CRITICAL VELOCITY



Jct # I-220.
PR. FIRE FLOW +
MDD (211.41L/s)
INPUTTED HERE

Oct 21, 2022
WATER MODEL KEYPLAN



WMI & Associates Limited
119 Collier Street, Barrie, Ontario L4M 1H5
p (705) 797-2027 f (705) 797-2028

Watermain Headloss Calculations 30 Sophia Street West

<<< Elements Requiring Input Information

$$\text{Velocity, } V = \frac{Q}{A} \quad (\text{m/s})$$

where, Q = Flow (m^3/s)

A = Cross-Sectional Area (m^2)

$$\text{Minor Head Loss, } H_L = (K_1 + K_2 + K_3 \dots) \times V^2 / 2g$$

where, $\sum K = (K_1 + K_2 + K_3 \dots)$

V = mean velocity (m/s)

g = 9.81 (acceleration due to gravity, m/s^2)

Hazen -Williams Equation (re-arranged for Friction Slope)

(Friction Head Loss Calculation)

$$\text{Friction Slope, } S = \frac{(V)^{1.054}}{(0.85CR)^{0.63, 1.054}} \times 100 \quad (\text{m}/100\text{m})$$

where, V = mean velocity (m/s)

k = 0.85 for SI units

C = Roughness Coefficient

R = hydraulic radius (m)

$$\text{Total Head Loss} = \text{Friction Head Loss} + \text{Minor Head Loss}$$

$$\text{Pressure (psi)} = \text{Pressure Head (m)} \times 1.422$$

$$\text{Total HGL} = \text{Ground Elev.} + \text{Pressure Head}$$

Date: 19-Oct-22

Project No: 22-770

Prepared by: CJ

Description	Pipe Design Coefficient C	Forcemain						Sum of Minor Loss Coeff. $\sum K$	Minor Head Loss (m)	Total Head Loss (m)	Total Pressure Loss (psi)	Pressure @ Pt. A (psi)	Pressure Head @ Pt. A (m)	Ground Elev. @ Pt. A (m)	Total HGL @ Pt. A (m)	Ground Elev. @ Pt. B (m)	Total HGL @ Pt. B (m)	Pressure Head @ Pt. B (m)	Pressure @ Pt. B (psi)
		Flow (L/s)	Diameter (mm)	Velocity (m/s)	Unit Friction Head Loss (m/100m)	Distance (m)	Friction Head Loss (m)												
Domestic Supply (100mm) Pr. Building	100	2.14	100	0.27	0.18	16.90	0.03	0.12	0.00	0.03	0.04	50	35.16	233.60	268.76	233.90	268.73	34.83	49.53
Fire (150mm) Pr. Building	110	210	150	11.88	101.07	16.90	17.08	0.12	0.86	17.94	25.52	50	35.16	233.60	268.76	233.90	250.82	16.92	24.06

NOTES:

Domestic Supply

- Loss Coefficient:

1 - Valve @ $K=0.12$

Fire Supply

- Loss Coefficient:

1 - Valve @ $K=0.12$

-Maximum Day Demand is 1.41L/s and Peak Hour Demand is 2.14L/s. As Fire Flow has its own separate supply, the Peak Hour Demand governs for domestic flow.

-Fire flow calculated from FUS was 101L/s. As proposed mixed use building is apartment/commercial, it is proposed to use the City of Barrie composite fire flow for the apartment and commercial land use which is 210L/s.

-Pressure in watermain system is assumed to be 50psi.