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

April 7, 2022
Revised October 23, 2024

Via: Email

The City of Barrie
70 Collier Street
P.O. Box 400
Barrie, Ontario
L4M 4T5

Attention: **Nadine Rush, Senior Development Services Technologist**

Re: **642 Dunlop Street West Development**
Water Servicing Design Brief
WMI File No.: 21-710. City File No.: D11-015-2022

Dear Nadine,

WMI & Associates Limited has been retained by 2507517 Ontario Inc. to prepare a Water Servicing Design Brief in support of a site plan application for the proposed mixed-use (residential and commercial) development located at 642 Dunlop Street West in the City of Barrie.

The following provides background information on the project, as well as an assessment of potable and fire water demand and the available supply from municipal infrastructure. The analysis presented herein is based on City of Barrie's Water Transmission and Distribution Design Standard (2022), the Ministry of the Environment's Design Guidelines for Drinking Water Systems (2008) and good engineering practice.

Background

The subject site comprises 0.81ha and is located at the north-east corner of Miller Drive and Dunlop Street West, near the western limits of the City. It is presently occupied by an auto mechanic shop and a used car lot, and consists of two small single story buildings.

There are existing 300mm diameter municipal watermains located on Miller Drive and Dunlop Street West, from which there are numerous water service connections and fire hydrants servicing the adjacent commercial and industrial lands. Fire protection for the site is provided by 3 municipal fire hydrants located along the Miller Drive and Dunlop Street West frontage, and potable servicing is provided by a single 19mm diameter water service which connects to the Miller Drive watermain.

The development proposed comprises a 5-storey building containing 71 residential units, 6 ground floor commercial units, and a ground floor parking garage. The building is to be of non-combustible construction and is to be equipped with an automatic sprinkler system. The building will be serviced by extending a 100mm diameter domestic service, and a 150mm diameter fire service watermain from the Miller Drive watermain.

Domestic Servicing

The maximum day water demand for the proposed development is determined to be 1.93L/s, based on MOE design guidelines and utilizing City-specific per capita and commercial unit demands. The estimated demand based on mechanical requirements, as determined by Hubbert-EME Engineering, is 122GPM (7.7L/s).

The sizing of the domestic service is based on the greater of the two anticipated demands, which in this case is the Hubbert-EME demand.

From this, and considering the anticipated static pressure conditions within the municipal water system, it is determined that a 100mm dia. water service is sufficient for the proposed development.

Supporting calculations and information from Hubbert-EME Engineering is appended to this Design Brief for reference.

Fire Protection

Fire protection to the development will be provided by existing municipal fire hydrants and by the building's internal sprinkler system. The site design is such that the fire department connection location and fire route satisfies minimum OBC and City of Barrie requirements.

The City of Barrie requires that fire hydrant flow tests be completed for all development applications to confirm that adequate pressure and fire flows are available from the existing municipal infrastructure to service new development. A hydrant flow test was completed on March 17, 2022 to confirm the available flows and pressures. From this, the available fire flow within the municipal water distribution system in the area of the proposed connection to Miller Drive is confirmed to be 260.6L/s.

The City's Water Transmission and Distribution Policies and Design Guidelines (2022) details the minimum fire flow requirements based on local area land uses. The minimum fire flow that would be most applicable for this scenario would be that for Apartments (200L/s), being that residential apartments is the primary land use proposed for the site. Since the available fire flow as confirmed from the hydrant flow test exceeds this threshold, the minimum requirement based on the proposed land use is satisfied.

A building-specific fire water demand analysis has also been undertaken by way of a Fire Underwriter's Survey (FUS) demand calculation, in accordance with municipal requirements. This calculation reveals that a fire flow of 166.7L/s is required. As this is less than the 200L/s land-use requirement, it does not govern.

A head loss calculation further confirms that the proposed 150mm watermain is sufficient to supply the anticipated fire (sprinkler) water demand to the building.

Supporting water servicing calculations and the hydrant flow test report are appended to this Design Brief for reference.

Conclusion

This Water Servicing Design Brief demonstrates that the existing municipal water system in the area of the Miller Drive & Dunlop Street West has sufficient capacity to service the proposed residential & commercial mixed use development.

Should you have any questions or require additional information, please contact the undersigned.

Respectively submitted,

WMI & Associates Limited

Jonathan Reimer, P. Eng.

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Barrie, ON L4N1W5
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HUBBERT EME ENGINEERING
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March 8, 2023

Project No.: 21-6206

WMI & Associates Limited
119 Collier Street,
Barrie, Ontario L4M 1H5

Attn: Mr. Jonathan Reimer

Re: Sanitary and Water Design Flow Rates
642 Dunlop St W
Barrie, ON
L4N 9W5

Dear Mr. Reimer,

Hubbert EME Engineering has been retained to complete sanitary and domestic water flow rates for the new development located at 642 Dunlop Street West, Barrie, Ontario. The intended purpose of the calculation is to provide accurate operating information, that will be used by the City of Barrie, during Site Plan Application process.

The new development consists of a 5-storey mixed-use building. It is our understanding that there are 6 ground floor commercial units and 72 residential units. Within our calculations, allowances have been made for a restaurant in the commercial area as well as a number of mop sinks, floor drains and hose bids. Our office has completed fixture unit calculations that have yielded results as noted below:

Domestic Water
From the OBC Tables 7.6.3.2. A and 7.6.3.2. B and Table 11-2 ASPE Vol 3
Domestic Water Flow: **122 GPM**
Water Meter Size: **3"**
Water Distribution Size: **2-1/2"**

Sanitary
From the OBC Tables 7.4.10.5 and 7.4.10.5(1)
Maximum discharge: **202 GPM**
Building Interior Sanitary Main (1% slope): **8"**
Anticipated Discharge Applying 70% Diversity Factor: **141 GPM**

Should there be any question regarding this document please contact the undersigned directly.

Sincerely,

Chris Langford, P.Eng.
Principal Engineer
chris@EMEeng.com

Seal:

WMI & Associates Limited
119 Collier Street, Barrie, Ontario L4M 1H5
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TOTAL DAILY DOMESTIC WATER SUPPLY FLOW CALCULATIONS

Date: 23-Oct-24 **Project No.:** 21-710

Project: 642 Dunlop Street West **Prepared By:** JR

<<< **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 Drinking Water Infrastructure Design Standard (2024)

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:											
Retail Units 1-6 (Store)					755.0		28	m3 / ha / day	0.02	0.04	0.07
Subtotal =					755				**0.02**	**0.04**	**0.07**
								Peaking Factor =		1.5	3
Residential Uses:											
Apartment dwellings: 71 units @ 1.67 persons /unit*	119						225	L/person	0.31	1.89	2.84
Subtotal =	**119**								**0.31**	**1.89**	**2.84**
Refer to Table 3-1 and/or Table 3.3 of the MOE Design Guidelines for Drinking-Water Systems (2008) >>>								**Peaking Factor =**		6.09	9.18
								Total Flows =	**0.33**	**1.92**	**2.92**

Notes:

***** Per capita domestic demand as per City of Barrie Drinking Water Infrastructure Design Standard (2024) section 4.3.1.
MDD + PHD is detrmined based on Tables 3-1 and Table 3.3 of the MOE Design Guidelines for Drinking-Water Systems (2008).

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FIRE PROTECTION WATER DEMAND
FIRE UNDERWRITERS SURVEY METHOD

Date: 26-Sep-24 **Project No.:** 21-710

Project: 642 Dunlop Street West **Prepared By:** JR

<<< **Elements Requiring Input Information**

Fire Protection Water Storage

Reference: Part 2- Water Supply for Public Fire Protection, Fire Underwriters Survey, 2020 (FUS 2020 document).
RFF=220*C*$\sqrt{A}$
where RFF=the required fire flow in litres per minute
C=coefficient related to the type of construction of the building
A= the total effective floor area in square metres of the building

C=	0.8		
A=	9000		
RFF=	16697	litres/min	
RFF [c] =	17000	litres/min	*-RFF rounded to the nearest 1000LPM*
Apply reduction for low contents fire hazard	-15%		
RFF [d]=	14450		*-RFF with occupancy adjustment factor*
Apply reduction for automatic sprinklers designed to NFPA 13 (30%), systems with water supply (10%) and fully supervised systems (10%)	30%		
Exposure Adjustment Charge (max 75%)	0%		*-Adjacent Buildings >30m away*
RFF=	10115	litres/min	*-RFF subtracting sprinklers reduction and adding exposure charge*
RFF [g]=	**10000**	litres/min	*-RFF rounded to the nearest 1000LPM*
=	**166.7**	litres/sec	

Note: RFF [c], [d]… etc. refers to the fire flow calculation procedure points as detailed on page 19 of the FUS 2020 document

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FLOW TEST RESULTS

FIRST FOR FIRE, LIFE SAFETY & SECURITY
VIPOND INC
est. 1945

DATE : MARCH 17, 2022

TIME VALVE OPENED : 11:05 AM

TIME LAST VALVE CLOSED : 11:20 AM

LOCATION : MILLER DR
BARRIE
ONTARIO

TEST BY : LEN.K–ETHAN.B

NAME OF CITY OPERATOR : REBECCA LYNN

STATIC PRESSURE : 73 PSI

SIZE OF UNDERGROUND MAIN : 300MM

TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (INCHES)	DISCHARGE CO–EFFICIENT	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	DISCHARGE (U.S.GPM)
1	1	1–3/4	0.995	70	43	584
2	1	2–1/2	0.90	69	20	754
3	2	2–1/2	0.90	66	17	1390

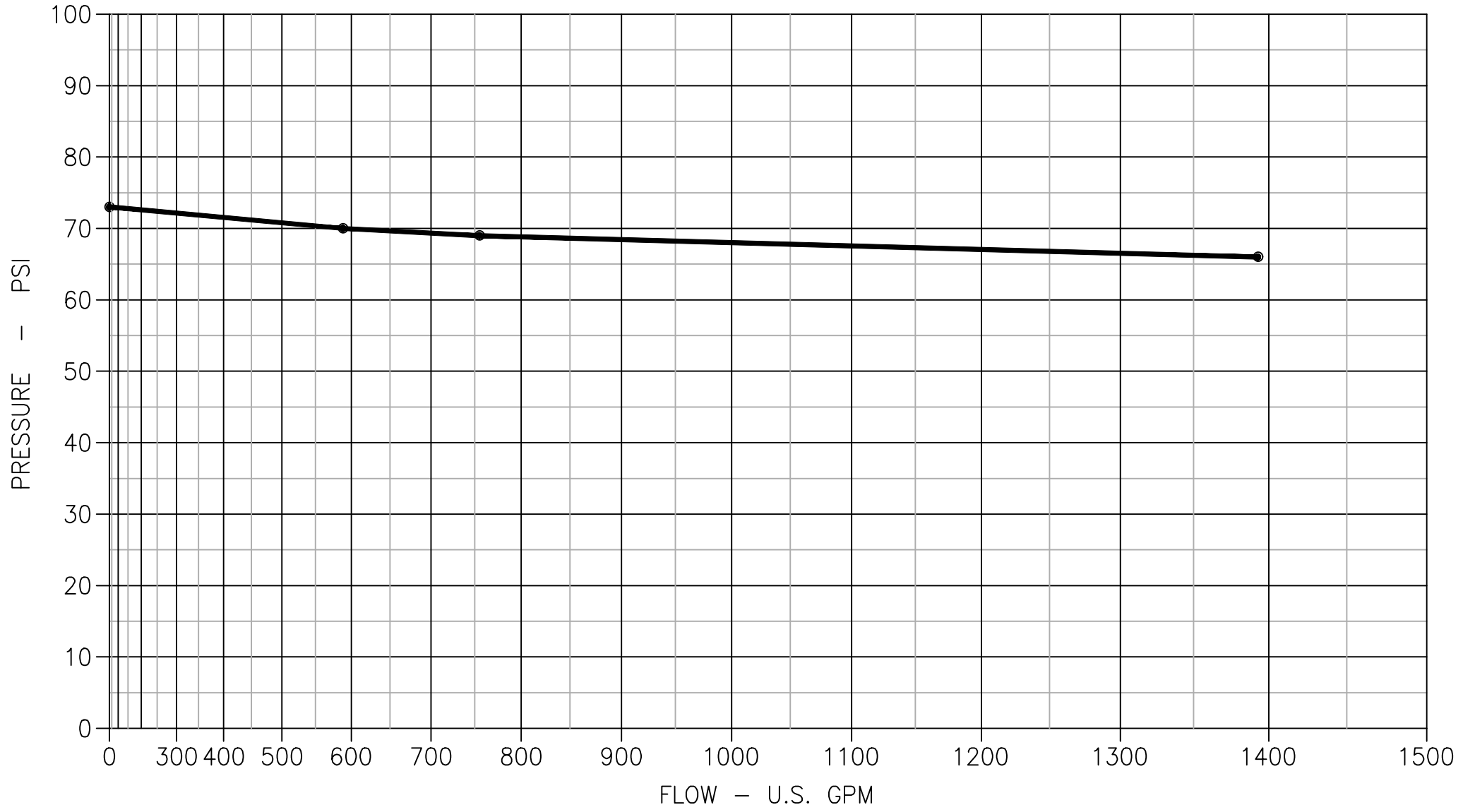
FIRST FOR FIRE, LIFE SAFETY & SECURITY

VIPOND INC

est. 1945

MILLER DR	BY : LEN.K/ETHAN.B
BARRIE	OFFICE : BARRIE
ONTARIO	TEST BY : VIPOND & PUC
	DATE : MARCH 17, 2022

STATIC:		RESIDUAL:		FLOW:
73 PSI	TEST#1	70 PSI	@	584 GPM
	TEST#2	69 PSI	@	754 GPM
	TEST#3	66 PSI	@	1390 GPM

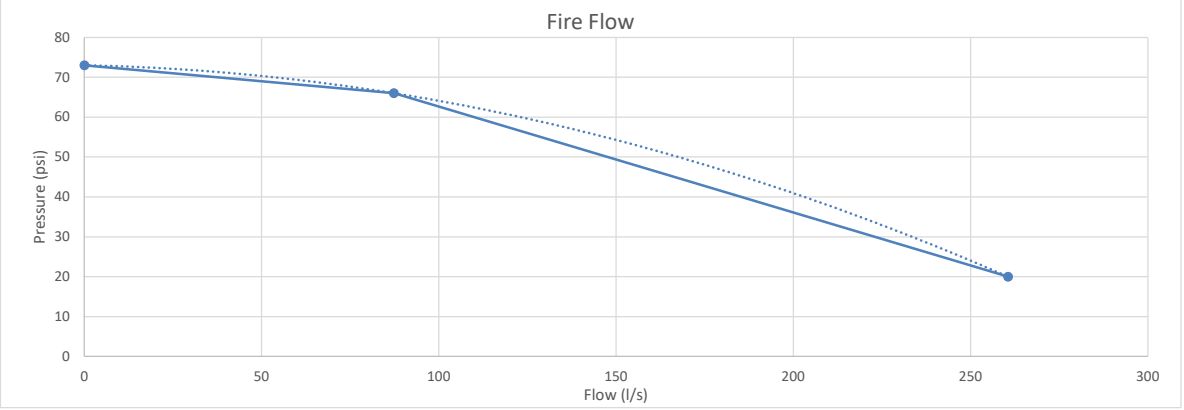


Fire Flow Test (v1.0)
City of Barrie
13-Mar-2023

Hydrant Number (Residual and Static Pressure)	3593	
Hydrant Number(s) (Flow)	3594	
Hydrant Street / Address (Residual and Static Pressure)	Miller Dr.	
Hydrant Street / Address (Flow)	Miller Dr.	
Hydrant Locations Figure (Residual/Static and Flow)	See Vipond Sketch	
Date of Test (DD/MM/YYYY)	17-03-2022	
Time (HH:MM AM or PM)	11:05AM	
Time (HH:MM AM or PM)	11:20AM	
Company Name	Vipond	
Employee Name(s)	Len.K - Ethan.B	
City of Barrie Employee Name(s)	Rebecca Lynn	
Static Pressure	73	psi
Residual Pressure	66	psi
Hydrant Elevation (Residual and Static Pressure)	250	m
Hydrant Elevation (Flow)	250	m
Elevation Difference (m)	0	m
Pitot Pressure - Outlet 1	17	psi
Pitot Pressure - Outlet 2	17	psi
Outlet Size	2.5	inch
Outlet Coefficient	0.9	
Pressure Drop Check (NFPA 291)	9.59	% Minimum pressure drop of 25% is recommended, please consider opening other outlets or flowing additional hydrants
Pressure Drop Check (AWWA M17)	7.00	psi Minimum pressure drop of 10 psi is recommended, please consider opening other outlets or flowing additional hydrants
Q Hydrant Flow - Outlet 1	692.06	US gpm
Q Hydrant Flow - Outlet 2	692.06	US gpm
Q Total Flow	87.32	l/s
Pressure at Desired Fire Flow	20.00	psi
Q Outlet 1_R	2064.91	US gpm
Q Outlet 2_R	2064.91	US gpm
Q $Total_R$	4129.83	US gpm
Q $Total_R$	260.55	l/s
Have any Cell formulas been changed? (Yes/No)	No	If Yes please indicate which ones and why
Hydrant Colour:	Blue	

Boundary Conditions (ET, Reservoir, BPS, PRV, Wells etc):
??

Other Considerations (flushing, fire, operational issues, outlet coefficient etc):
??



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Watermain Headloss Calculations
642 Dunlop Street West- Internal Watermain (Domestic)

<<< **Elements Requiring Input Information**

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

where, Q = Flow (m^3/s)
A = Cross-Sectional Area (m^2)

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

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

Friction Slope, $S = \frac{(V)^{1/0.54}}{(0.85CR^{0.63})^{1/0.54}} \times 100$ (m/100m)

where, V = mean velocity (m/s)
k = 0.85 for SI units
C = Roughness Coefficient
R = hydraulic radius (m)

Total Head Loss = Friction Head Loss + Minor Head Loss

Pressure (psi) = Pressure Head (m) x 1.422

Total HGL = Ground Elev. + Pressure Head

Date: 13-Mar-23
Project No: 21-710
Prepared by: JR

Description	Pipe Design Coefficient C	Forcemain						Sum of Minor Loss Coeff. ∑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)												
Internal Domestic Watermain	**100**	**7.7**	**100**	0.98	1.91	**35.00**	0.67	**1.00**	0.05	0.72	1.02	**66**	46.41	**234.90**	281.31	**236.25**	280.60	44.35	**63.06**

NOTES:
- Flow= 7.7L/s (122USGM) - per mechanical requirements.
-Pressure @ point A = residual watermain pressure under a dual port flow scenario as identified from the hydrant flow test.
-C = 100 for 150mm dia.; C = 110 for 200-250mm dia., C = 120 for 300mm dia.; as per the City of Barrie's Water Transmission and Distributiuin Design Standard (2022 document)

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Watermain Headloss Calculations
642 Dunlop Street West- Internal Watermain (Fire-Feeding Building Sprinklers)

<<< **Elements Requiring Input Information**

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

where, Q = Flow (m^3/s)
A = Cross-Sectional Area (m^2)

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

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

Friction Slope, $S = \frac{(V)^{1/0.54}}{(0.85CR^{0.63})^{1/0.54}} \times 100$ (m/100m)

where, V = mean velocity (m/s)
k = 0.85 for SI units
C = Roughness Coefficient
R = hydraulic radius (m)

Total Head Loss = Friction Head Loss + Minor Head Loss

Pressure (psi) = Pressure Head (m) x 1.422

Total HGL = Ground Elev. + Pressure Head

Date: 13-Mar-23
Project No: 21-710
Prepared by: JR

Description	Pipe Design Coefficient C	Forcemain						Sum of Minor Loss Coeff. ∑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)												
Internal Watermain	**100**	**24.6**	**150**	1.39	2.27	**35.00**	0.80	**1.00**	0.10	0.89	1.27	**66**	46.41	**234.90**	281.31	**236.25**	280.42	44.17	**62.81**

NOTES:
- Flow= 24.6L/s (~390USGM) is estimated to be the maximum demand required by the building sprinkler system (TBC by mechanical engineer).
-Pressure @ point A = residual watermain pressure under a dual port flow scenario as identified from the hydrant flow test.
-C = 100 for 150mm dia.; C = 110 for 200-250mm dia., C = 120 for 300mm dia.; as per the City of Barrie's Water Transmission and Distributiuin Design Standard (2022 document)